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## STUDIES ON THE LOCALIZATION OF CEREBELLAR TUMORS.

### V. THE CRANIAL NERVES.


By Ernest G. Grey, M. D.

*(From the Surgical Service of the Peter Bent Brigham Hospital, Harvard Medical School.)*


In the previous four papers of this series on localization in the posterior cranial fossa the following topics have been considered: staggering-gait, limb-ataxia, the Romberg test and adiadococinesis;[1] the pointing reaction and the caloric test;[2] posterior new growths without nystagmus;[3] and the position of the head and suboccipital discomforts.[3] The present report has to do with the significance of cranial nerve involvements. It is based upon an analysis of the records of 63 cases with intra- or extra-cerebellar tumor confirmed either at operation or on post-mortem examination.

As previously stated, the material has been drawn from the records of a series of several hundred patients with syndromes of cerebellar disease in the neurological services of Dr. Cushing at The Johns Hopkins Hospital previous to October, 1912, and at the Peter Bent Brigham Hospital since that date. Most of the cases have been personally observed by the writer.

The surgical treatment of subtentorial new growths now embraces a bilateral approach to the posterior fossa which affords the opportunity to investigate not only the two cerebellar hemispheres but also the recess on either side. Notwithstanding this, however, there still remains a small proportion of cases in which the tumors lie anteriorward and are not exposed at the first operation. It is for cases of this type that it seems desirable to secure as much information as is available regarding cranial nerve involvements in order to appraise more correctly their value as localizing guides.

For the purpose of the present analysis subtentorial new growths have been divided into four groups: first, the unilateral cerebellar tumors—those which involve one hemisphere;* second, the median tumors—those which involve the vermis and approximately equal amounts of each lateral lobe; third, the unilateral recess tumors—those which lie in one

*** In three patients suffering from unilateral endotheliomata the tumors did not occupy the usual position in the cerebellopontine angle, but lay more posteriorward, embedded in the lateral lobe. They were so characteristically cerebellar tumors, however, that they have been included in this group.**

cerebellopontine angle; and fourth, the median extracerebellar tumors which lie inferior to the vermis.

The extent of the cranial nerve involvement is often dependent upon the stage of the disease. The determination as to what period is "early" and what is "late" rests, as Collier [7] has pointed out, upon the severity of the symptoms and the rapidity of growth of the tumor. In the present report the findings fairly well represent an average picture since they include both incipient and advanced cases. They illustrate, furthermore, the range of symptoms exhibited by a series of such individuals when they first appear for surgical treatment.

Many explanations are offered to account for the appearance of contralateral nerve palsies. Thus the N. abducens is sometimes affected indirectly through constriction by the lateral branches of the basilar artery (Cushing [9]). The cranial nerves on the side opposed to the lesion are occasionally stretched and injured through a displacement of the pons and the medulla from the median line in the direction of the tumor by a dislocated cerebellar lobe, or by pressure on the contralateral side of the pons by the displaced cerebellar lobe (Spiller [11]). In certain instances the nerves opposite the lesion may be injured by pressure against the sharp edge of the dura where they emerge from it (Wernicke [13]). More often, probably, such a palsy arises through pressure of the pons and medulla of the opposite side against the base of the skull.

### Nervi Olfactorii.

*Historical.*—In patients with increased intracranial tension Muskens [3] has determined that disturbances of the olfactory sense are of frequent occurrence. Where large new growths occupied the posterior cranial fossa he found more involvement of the first cranial nerve than was evident with tumors situated elsewhere in the brain. The usual explanation of this is that the dilated third ventricle crowds the structures to either side of it and results in pressure on the nerve. Mingazzini,[8] however, has reported a case of cerebellar disease in which he attributed an anosmia on the side contralateral to the tumor to pressure on the pole of the temporal lobe.

Mills [5] and others have suggested that in some cases the anosmia may result from nerve-choking similar to that which occurs in choked disc. Collier,[7] on the contrary, found that anosmia was not more frequent among his cases with secondary atrophy than among the patients suffering with diseases other than of the nervous system.

*Unilateral Cerebellar Tumors* (24 cases).—Only 1 patient showed an involvement of the olfactory nerve (complete anosmia) on admission. An advanced choked disc here pointed toward a marked increase in intracranial tension. A second patient detected odors readily but complained of occasional hallucinations of smell. The choked disc here measured about 3 D.

*Median Cerebellar Tumors* (16 cases).—In this group only 1 showed a definite impairment of the first nerve. The eye-grounds in this instance revealed advanced changes with a considerable disturbance of vision.

*Cerebellopontine Tumors* (18 cases).—A complete anosmia was found in 2 patients, both of whom had old choked discs. In one instance secondary atrophic changes had advanced almost to blindness. A third patient, with an optic disc elevation of 5 D., gave the history of disturbances of smell particularly on one side; examination, however, disclosed no appreciable decrease in olfactory discrimination. Smell was very slightly affected in another—choked disc of 5 D.

*Median Tumors Inferior to the Cerebellum* (3 cases).—None of the patients in this group experienced any appreciable impairment of smell.

*Comments.*—The sense of smell was definitely impaired during the course of the growth of a subtentorial tumor in 4 of a series of 61 patients. Each of the four patients showed a definite increase of intracranial pressure as determined by the elevation of the optic discs, by Roentgen-ray study of the skull, and by operative findings, namely, increased tension of the cerebellar structures, herniation of the medulla and cerebellum into the spinal canal, etc. Many of those with a normal olfactory sense, however, showed an equally marked rise of intracranial pressure.

In Dr. Cushing's opinion, anosmia is almost always a false localizing sign (Fern-Symptom) and may be due to nerve constriction. In a patient with a large unlocalized endothelioma, who died some months after a palliative operation and who had a complete anosmia, he found that the olfactory nerves were almost completely severed by the interclinoid dural margin. It is possible that this may be a common explanation of the symptom.

Several of the patients in this series gave a history of hallucinations of smell. Undoubtedly these were distant symptoms also due to the secondary internal hydrocephalus.

### Nervi Optici.

*Historical.*—It has long been recognized that choked disc is of very frequent occurrence in patients with cerebellar new growths and that, as a rule, it appears early in the course of the disease and rapidly advances to secondary atrophy unless decompressive measures are adopted. Finkelnburg [16] however, has recorded four cases of cerebellar tumor, verified by operation, in which choked disc was absent throughout the entire periods of observation. And Mingazzini cites cases of cerebellar new growth, some without appreciable changes in the eye-grounds and others with primary optic atrophy. Growths in the cerebellopontine angle, of course, may exist for years without leading to changes in the fundi.

*Unilateral Cerebellar Tumors* (25 cases).—Four patients showed increased tortuosity of the veins, hyperemia of the disc, or more or less filling of the cup with edema of the nerve-head, without having any measurable elevation of the latter. A marked swelling of 5 or more D. was evident in 6. In 10 the degree of swelling varied from 1 to 5 D. The remaining 5 on admission showed the picture of secondary optic atrophy with receding discs.

*Median Cerebellar Tumors* (16 cases).—In 1 merely a slight haziness of the disc margins was observed. There were 6 with secondary atrophy, 6 with advanced elevation of the discs, and 3 with less marked, but nevertheless definite choked disc.

*Cerebellopontine Tumors* (19 cases).—Every patient in this group had choked disc. Two showed marked changes—over 5 D. swelling. In 4 the degeneration had advanced to secondary atrophy.

***Median Tumors Inferior to the Cerebellum*** **(3 cases).—A full-blown choked disc was found in each of the 3 patients.**

*Comments.*—In all but 6 of the 63 patients there was a definite choked disc. The fundi in these six, with one exception, showed changes, most of which we regard as indicative of increased intracranial tension. Minor changes of this nature with very little elevation of the disc, of course, are chiefly significant when the history and repeated ophthalmoscopic study demonstrate that they have appeared since the onset of the trouble.

The tumors in the six cases just referred to were all intracerebellar. Except for one instance (cerebellar tubercles in a patient with an illness of six weeks) the duration of symptoms previous to admission was not appreciably less than that of many of the cases of the same class with definite choked disc.

While recess tumors may exist for years without appreciably affecting the fundi, a swelling of the nerve-head is practically inevitable in the later stages of the disease. It does not occur, however, until there is some obstruction to the cerebrospinal fluid outflow and, consequently, it is an important indication of an existing internal hydrocephalus.

While choked disc in itself has no appreciable localizing significance, since it is not infrequently noted comparatively early in the course of certain supratentorial tumors, it may have some importance in this respect when it is associated with other signs. It is our experience that the early appearance and high degree of changes in the eye-grounds, when they appear in company with some of the so-called cerebellar symptoms, are important confirmatory evidence pointing toward a subtentorial localization of the new growth.

### NERVI OCULOMOTORII ET ABDUCENTES.

*Historical.*—Weakness of the muscles supplied by the third, fourth and sixth nerves in patients with cerebellar tumors is rarely due to a primary involvement of these nerves or their nuclei, but is usually the result of a peripheral involvement, as a rule, of a secondary nature. A nuclear type of paralysis with a paresis of a number of eye muscles of both sides occurs especially in tumors of the vermis where pressure is exerted in the direction of the corpora quadrigemina (Mingazzini).

Mills [25] quotes Wernicke as stating that sixth nerve paralysis is most apt to be present as a distant symptom when the tumor is situated in the cerebellum, and he points out that in this respect the sixth nerve differs from the third nerve which is more likely to give distal symptoms with a lesion of the cerebral hemispheres. That the abducens is indirectly paralyzed more often than any other cranial nerve has been emphasized by Collier.

Because of this extreme sensitiveness of the abducens to basalward directed pressure Homburger and Brodnitz [29] look upon isolated sixth nerve paresis as an important localizing sign for subtentorial new growths. They do not regard this, however, as evidence pointing toward the side of the lesion, for such a paralysis frequently occurs contralateral to the tumor. Since a paresis of these nerves in cerebellar tumor is due frequently to an obstructive internal hydrocephalus, it is clear that any pathological process which leads to a primary or secondary hydrocephalus—such as meningitis—may similarly affect the eye muscles. Such cases have been reported by Bramwell [6] and others. But lesions of this type are relatively uncommon as compared with cerebellar new growths.

Stewart and Holmes [39] found that the majority of the patients developed varying degrees of external rectus palsy on the side of the disease—often transitory and liable to recur. As a rule, this was more marked in the patient with extra- than in those with intra-cerebellar tumor. In the latter class of patients both external recti were often affected, though the involvement was always greater on the side of the lesion. This bilateral weakness was met with most frequently in tumors of the vermis compressing the floor of the fourth ventricle.

*A weakness or paralysis of the conjugate lateral movements of the eyeballs* towards the side of the new growth has been frequently found in patients with subtentorial tumors (Bruns,[5] Bruce,[7] Oppenheim,[40] Stewart and Holmes,[39] and others). When secondary atrophy has led to blindness, the eyes at rest are frequently kept deviated to the side opposite the growth. Mills places paresis of the associated ocular movements in patients of this class among the most common effects of cranial nerve involvement. Such a conjugate deviation, however, is not always toward the side contralateral to the disease, for, as Bruce [7] has pointed out, irritative lesions of Deiters' nucleus may lead to associated ocular movements in the direction of the tumor. At present many hold that such disorders are not manifestations of cerebellar disease, but are due secondarily to unilateral compression of the pons. Disease of the nerves supplying the eye muscles alone almost never causes paralysis of conjugate deviation.

*Skew deviation* (a downward and inward position of the eye on the side of the lesion and an outward and slightly upward position of the other eye) has been described in cerebellar tumor. It was observed frequently, after acute attacks and after operation, by Stewart and Holmes. Oppenheim [40] has encountered it much less often and then almost only after operation.

*Nystagmus* is generally regarded as one of the most significant symptoms of cerebellar affections. While in such cases it is held to be an expression of disease of either the ear or the central nervous system (Bárány [2]), it may appear, in cases in which an ocular muscle has been paralyzed but is in process of recovery, if the eyes are directed steadily in a direction which necessitates the active movement of the formerly paralyzed muscle (Steward [41]). It appears probable that nystagmus of cerebellar origin results from an ataxia of the extrinsic eye muscles (Mills and Weisenburg,[25] Wilson and Pike,[44] and others). In view of these considerations it seemed best to include certain clinical features of this symptom in the present report on cranial nerve involvements, none of which were touched upon in an earlier paper of this series (Grey [11]).

According to Stewart and Holmes [39] and Bruns,[5] the character of the jerks has some localizing significance. They regard as typical, slow, deliberate jerking movements to the side

of the lesion on looking in this direction, with a gradual recession of the eyes toward the middle plane. To the opposite side the movements are of smaller range and occur in more rapid succession.

Spontaneous nystagmus with the eyes directed forward is occasionally observed in patients with new growths in the posterior fossa. In direction, according to Bárány,[2] Wilson and Pike,[25] and others, the slow deviation may be away from the side of the lesion though it may be to the sound side, depending on whether we are dealing with an irritative or a destructive lesion. Horsley[26] has shown that a careful electrical stimulation of the white matter in the neighborhood of the dentate nucleus or of the body of the dentate nucleus itself, provokes a horizontal nystagmus towards the side excited. This, however, is not the view of Joliat,[23] who believes that a localized cerebellar lesion manifests itself by a nystagmus always directed toward the diseased side.

*Unilateral Cerebellar Tumors* (26 cases).—Eye muscles unaffected: 10 patients—3 with incipient optic changes, 4 with choked disc of 2, 3, 7 and 8 D., respectively, and 3 with secondary atrophy (blind).

History of diplopia but no apparent paresis: 4 patients—3 with advanced choked disc and 1 with secondary atrophy.

Homolateral abducens alone affected: 3 patients—in 1 very slightly (discs hyperemic), in a second definitely (choked disc of 3 D.), and in a third a paralysis (choked disc of 3 to 4 D.).

Contralateral abducens alone affected: 1 patient—choked disc of 3 to 4 D.

Both sixth nerves alone affected: 2 patients—equally involved in 1 (normal eye-grounds), and more homolateral to the lesion in the other (choked disc of 3 to 4 D.).

Oculomotor nerve alone affected: 2 patients—slightly involved homolateral to the disease in 1 (choked disc of 2 to 3 D.), and both weak in the other (early secondary optic atrophy).

Conjugate ocular movements affected: 7 patients—in 1 toward the tumor (blind); in a second toward the side contralateral to the lesion (blind); in a third, to some extent in all directions (choked disc of 3 D.); and in a fourth, good in all directions, but poorly sustained (choked disc of 5½ to 6 D.). Conjugate deviation was only slightly restricted toward the disease in the remaining 3.

*Median Cerebellar Tumors* (16 cases). Eye muscles unaffected: 4 patients—2 with incipient changes, 1 with choked discs of 1½ and 3 D., and another with secondary atrophy and blindness.

History of diplopia but no apparent paresis: 1 patient—choked disc of 2 D.

Unilateral weakness of the abducens alone: 4 patients—in 2, in which one hemisphere was slightly more involved than the other, the paretic muscle was homolateral to the more affected side—choked disc of 7 D. and secondary atrophy respectively. The 2 remaining patients had advanced choked disc.

Both sixth nerves alone affected: 2 patients—choked disc of 6 to 7 D. and secondary atrophy, respectively.

One oculomotor nerve alone affected: 3 patients—all had advanced choked disc.

Unilateral weakness of the abducens and oculomotor nerves: 1 patient—choked disc of 6 to 8 D.

External ophthalmoplegia: 1 patient—choked disc of 6 to 7 D.

Conjugate ocular movements affected: 4 patients—in all there was some restriction to one side (all had advanced choked disc).

*Cerebellopontine Tumors* (19 cases). Eye muscles unaffected: 6 patients—1 with choked disc of 2 D., 4 with an elevation of 3 to 5 D., and 1 with early atrophy.

History of diplopia but no apparent paresis: 2 patients—choked disc of 1 to 1½ D. and 5 D., respectively.

Homolateral abducens alone affected: 2 patients—choked disc of 3 to 4 D. each.

Oculomotor nerve alone affected: 5 patients—in 2 the homolateral nerve (3½ and 4 D., respectively); in 1 the contralateral nerve (4 to 5 D.); and in 2 both nerves (more on the homolateral side—choked disc of 5 D. and secondary atrophy, respectively).

Abducens and oculomotor each affected: 3 patients—in 2, both homolateral (choked disc of 3 to 4 D. and blind, respectively); and 1, the homolateral sixth and contralateral third nerves.

Conjugate ocular movements affected: 2 patients—in 1, restricted in all directions (5 D.); in the other, restricted toward the lesion (4 to 5 D.).

*Median Tumors Inferior to the Cerebellum* (3 cases).

Eye muscles unaffected: One patient—choked disc of 5 D.

Both abducentes affected: 2 patients—choked disc of 3 to 4 D. in each.

Skew deviation of eyes: Definite in 1 patient before operation.

Conjugate ocular movements affected: 1 patient—restricted in all directions (6 D.).

*Nystagmus—Character of the Jerks with the Eyes in the Lateral Positions.*

Unilateral Cerebellar Tumors (13 cases with lateral nystagmus):

- Jerks slower and coarser with eyes toward the lesion: 8 patients (one doubtful).
- Jerks to either side equal in rate and size: 5 patients.
- Irregular jerks with eyes toward the lesion (none in other positions): 2 patients.
- Irregular jerks with eyes away from the lesion (none in other positions): 2 patients.

Median Cerebellar Tumors (10 cases with lateral nystagmus):

- Jerks to either side equal in rate and size: 5 patients (in 3, coarser to one side in other examinations).
- Jerks slower and coarser to one side: 5 patients (in 3 with asymmetrically placed tumors the coarser jerks corresponded to the most involved side).

Cerebellopontine Tumors (17 cases with lateral nystagmus):

- Jerks coarser and slower with eyes toward the lesion: 8 patients.
- Jerks equal in rate and size to either side or variable from day to day: 9 patients.

Medial Tumors Inferior to the Cerebellum (3 cases).

- Jerks equal in rate and size to either side: 1 patient.
- Jerks variable in character from day to day: 2 patients.

*Spontaneous Nystagmus with the Eyes Forward—Its Direction.* (Present in 12 of 29 cases with lateral nystagmus examined; the direction was noted in 10).

- Unilateral tumors with quick component away from the tumor: 6 patients.
- Unilateral tumors with the quick component toward the tumor: 1 patient.
- Median tumors with nystagmus to one side: 3 patients.

*Comments.*—As regards the abducens palsy and the resultant diplopia, it would seem that many of the involvements may be attributed to a strangulation of the nerve by the lateral branches of the basilar artery. Since this type of lesion was first pointed out by Dr. Cushing,[10] numerous corroborative specimens have been obtained in this clinic. To preserve the relationship of the vessels to the nerve which exists *intra vitam*, for post-mortem examination, it is of course essential that the brain be hardened with formalin *in situ* before it is removed.

Since no recognizable relationship has been found to exist between the degree of involvement of the third and sixth cranial nerves and the degree of intracranial pressure, it is probable that such lesions are mainly dependent upon the situation of the new growth below the tentorium and the individual variations in the configuration of the lower surface of the brain and the base of the skull. For the purpose of localizing tumors in one or another part of the posterior cranial fossa, a paresis or a paralysis of these nerves has practically no significance.

In several patients, when the eyes were directed forward, the slightest change in the position of the eyeballs would bring about a reversal in the direction of the nystagmus. In certain others having spontaneous nystagmus with the eyes directed forward, a slight movement to one or the other side of the midline would obliterate the jerks. Fixation—*i. e.*, voluntary effort—as a rule, induced or increased the oscillations of the eyes.

It was pointed out in an earlier report (Grey [22]) that there was no discernible relationship between the degree of intracranial pressure and the presence or absence of nystagmus. This finding and the observations recorded above are clinical data in favor of the view held by many that the nystagmus seen in cerebellar disease is very frequently of cerebellar origin —an asynergy of the eye muscles.

In the paper on nystagmus just referred to, it was shown that this symptom may be absent in certain new growths of the vermis and hemispheres. Caloric tests in most of the cases cited demonstrated an absence of any impairment of the fundamental mechanism of labyrinthine nystagmus. When this report was made, it was suggested that the absence of rhythmic movements of the eyes in a patient exhibiting a cerebellar tumor syndrome points toward an intracerebellar localization of the lesion. Since that time only one case has appeared in this clinic which has proven to be an exception to the rule. In this instance there was a fourth ventricle tumor lying inferior and somewhat posterior to the vermis.

An impairment of conjugate deviation of the eyes is frequently encountered in the advanced cases. While this impairment is described as being toward the diseased side, we have seen paralysis of conjugate movements toward the opposite side. Since such a paralysis is thought to be due, in many instances, to lateral pressure upon the pons, a contralateral weakness may be explained in much the same way as are the motor and sensory changes occasionally noted in the homolateral extremities, *i. e.*, by pressure upon the opposite side of the pons.

In the less advanced cases impairments of this nature are much more infrequent. It is with the earlier type of lesion that we have most to do at present, thanks to the more prompt recognition of cerebellar disease by the medical profession, and, accordingly, affections of associated, lateral, ocular movements have no great significance for localizing subtentorial tumors within the posterior fossa.

Skew deviation of the eyes is rarely seen prior to operation in tumors of the posterior cranial fossa.

The rule which states that the nystagmus is slower and coarser with the eyes turned toward the tumor is subject to many exceptions. When, however, there is a definite and persisting difference in the size and rate of the jerks with the eyes in the lateral positions, the nystagmus is usually suggestive of the side of the lesion.

### NERVI TRIGEMINI.

*Historical.*—An impairment of the corneal reflex (Hyporeflexie oder Areflexie der cornea) is regarded by Oppenheim [23] as one of the most important features of the symptomatology of unilateral tumor in the posterior fossa. Since the activity of the corneal reflex may be affected by lesions elsewhere in the brain, Redlich [24] considers this sign to be of great diagnostic value only when it is found early in the course of the disease before the severe general pressure symptoms and definite nerve palsies appear. Areflexia cornealis has been reported in the eye contralateral to the tumor (Rossbach [25]).

Irritative symptoms of pressure on the fifth nerve—hyperesthesia, neuralgic pain, etc.—are likewise among the early indications of a tumor encroaching upon the pons. They appear on the side of the new growth (Monakow [26]) in the skin and mucous membrane innervated by the trigeminus (Cushing [27]).

Disturbances of taste in the anterior two-thirds of the tongue are here considered under the fifth nerve, though there still remains considerable uncertainty regarding the course of the gustatory fibers beyond the chorda tympani (Quix [28]). In a study of the effects of trigeminal neurectomy Dr. Cushing [29] was led to believe that the fibers did not pass by way of the trigeminus. Mingazzini [30] only rarely found taste disturbed in cerebellar tumors.

The sensory division has been found to be more often affected than the motor in both intra- and extra-cerebellar tumors (Stewart and Holmes, Bruns, and Mingazzini).

Where the motor division of one trigeminus is paralyzed, there is a failure of the corresponding masseter and temporalis to contract in chewing, and the jaw can be moved only toward the affected nerve. On opening the mouth the jaw deviates to the affected side.

*Unilateral Cerebellar Tumors* (25 cases).
- Neither trigeminus affected: 12 patients.
- Cutaneous sensory disturbances—irritative or paretic: on the side of the lesion, 2 patients; on the side opposite the lesion, 4 patients; on both sides, 2 patients.
- Corneal reflex affected: homolateral to the tumor, 1 patient; contralateral, 1 patient; on both sides, 1 patient.
- Taste: anterior two-thirds of tongue affected, 4 patients.
- Motor division affected: homolateral to the tumor, 2 patients; contralateral, 3 patients.

*Median Cerebellar Tumors* (16 cases).
- Neither trigeminus affected: 3 patients.
- Cutaneous sensory disturbances: unilateral, 3 patients (in 1, with a symmetrical growth, homolateral to more affected side).
- Corneal reflex affected: unilateral, 2 patients; bilateral, 1 patient.
- Taste affected: 2 patients (unilateral).

Motor division affected: unilateral, 2 patients.

*Cerebellopontine Tumors* (19 cases).

Neither trigeminus affected: 4 patients.

Cutaneous sensory disturbances: homolateral, 10 patients; contralateral, 1 patient; bilateral, 2 patients.

Corneal reflex affected: homolateral, 6 patients; contralateral, 1 patient; bilateral, 3 patients (in 2 more on the side of the lesion).

Taste affected: homolateral, 4 patients; contralateral, 1 patient; bilateral, 2 patients.

Motor division affected: homolateral, 4 patients; contralateral, 1 patient.

*Median Tumors Inferior to the Cerebellum* (3 cases).

Neither trigeminus affected: 3 patients.

*Comments.*—From the analysis given above the conclusion may be drawn that, in subtentorial new growths, involvements of the fifth nerve have no topographical importance in diagnosis (within the posterior cranial fossa) unless the tumor lies in the cerebellopontine angle. Such a localization is likely only when the homolateral eighth (or seventh) nerve is also affected.

Clinical and post-mortem observations in this clinic have repeatedly demonstrated that the fifth and seventh nerves may be stretched to a surprising extent by recess tumors, without any serious interference with their function, provided that the new growths are sufficiently slow in their growth to permit accommodation of the nerves to the new conditions. It appears that the eighth nerve is less able to accommodate itself under similar circumstances. The greater frequency of involvement of the auditory nerve as compared with the trigeminus and the facialis, however, is in part explained by the fact that recess tumors grow from the former much oftener than they do from the latter.

In several patients suffering from early recess tumors, who complained of pain in the distribution of the trigeminus without appreciable symptoms of increased intracranial tension, the differentiation from tic douloureux was very difficult for a time. The detection of slight sensory changes on the affected side, of course, led to the correct diagnosis.

The recognition of the cause of this type of trigeminal pain is important, since cases are on record (Weisenburg [32]) in which the condition has been mistaken for tic douloureux and been treated by an operation on the Gasserian ganglion.

### Nervi Faciales.

*Historical.*—A weakness of the seventh nerve similar in origin to the asthenia noted in the homolateral limbs was never encountered by Stewart and Holmes. Mills and Weisenburg, however, have observed not only a unilateral loss of emotional expression but also a loss of all or almost all expression, both of which they attribute to cerebellar disease.

Fibrillary twitchings in the distribution of the seventh nerve and even convulsions which appear to be Jacksonian in character may form conspicuous features of the symptomatology of a recess tumor (Mills,[28] Weisenburg [32]).

Spiller [31] has drawn attention to a form of dissociation of facial movement which may be the first sign of weakness of the facial nerve from pressure of an angle tumor. This consists of a loss of emotional movement of one side of the face with preservation or possible slight impairment only of voluntary movement of the same side. In connection with slight nerve deafness, this may be of localizing value.

The fact has been pointed out by Lasaren [20] that the lowest branch alone of the facial may be affected by tumors of the posterior fossa, both for voluntary and emotional movements. Since minor degrees of asymmetry of the face, however, are found not infrequently in normal individuals, it is occasionally difficult to interpret slight differences between the two sides.

As is well known, a lesion of the cortico-nuclear path results in a lower facial palsy of the opposite side. It is accompanied, as a rule, by a paresis or paralysis of the extremities also on the side opposite to the disease. A crossed paralysis (hemiplegia alternans) exists only when the fibers are affected between the place of crossing of the facial paths and the nuclei of the seventh nerves.

When the peripheral nerve is involved, all of the branches are affected and, since the nucleus is the trophic center, electrical examination shows (where the nerve is paralyzed) a reaction of degeneration. In pontine disease the upper facial is frequently spared. The differentiation between lesions which affect the facial nerve in the pons and those which involve it in its peripheral course rests upon the presence of other symptoms which result from the disturbance of neighboring structures by the new growth. A facial palsy which appears on the side opposite to that of a cerebellar tumor is probably due to pressure on the pons (Stewart and Holmes). The seventh nerve (the nerve trunk which arises in the pons from the lower and upper facial nuclei) is purely motor and has no sensory functions (Mills [24]).

*Unilateral Cerebellar Tumors* (25 cases).

Neither facial nerve affected: 17 patients.

Homolateral facial nerve affected: 5 patients—3 in both upper and lower divisions; 2 in lower division alone.

Contralateral facial nerve affected: 1 patient.

Questionable involvement of facial nerve: 2 patients—in 1, homolateral; and in the other, contralateral.

*Median Cerebellar Tumors* (16 cases).

Neither facial nerve affected: 13 patients.

One facial nerve affected: 2 patients—in upper and lower divisions in both.

Questionable involvement of one facial nerve: 1 patient—lower division only.

*Cerebellopontine Tumors* (19 cases).

Neither facial nerve affected: 6 patients.

Homolateral facial nerve affected: 8 patients—in 4 the weakness was discernible in the lower division only.

Questionable involvement of one facial nerve: 5 patients—homolateral in 1; and contralateral in 4.

*Median Tumors Inferior to the Cerebellum* (3 cases).

Neither facial nerve affected: 3 patients.

*Comments.*—The results of the clinical observations on involvements of the seventh cranial nerve indicate that a paresis of one facialis in subtentorial tumor is strong presumptive evidence of the side of the lesion, though it appears not infrequently in median growths. A questionable involvement of the seventh nerve, on the other hand, is deceptive in this re-

spect, due probably to the relative frequency of normal facial asymmetries of slight degree.

Mills and Weisenburg have recorded two cases of cerebellopontine tumor with convulsions of the facial muscles which appeared to be Jacksonian in character. A similar case, in this clinic at the present writing, deserves to be reported. A man of 34 years with a left recess endothelioma showed, besides the usual signs of increased intracranial pressure, a very slight motor and sensory involvement of the fifth nerve and a more marked affection of the eighth on this side, but no weakness of either seventh nerve. The muscles in the whole distribution of the homolateral facialis, however, showed frequent clonic spasms lasting one-half to two or three minutes. There was no trigeminal pain. In addition to the cranial nerve disorders, there was a slight disturbance of sensation in the leg of the same side, together with a definite weakness and a measurable atrophy of the thigh muscles; and tests for coordination elicited asynergic movements, particularly in the limbs homolateral to the spasms. The patient was bedridden, but careful questioning made it seem very probable that he had had a staggering, drunken gait previous to the appearance of the unilateral sensory and motor disturbances.

The facial convulsions of Jacksonian character coupled with the sensory and motor changes all in the same half of the body strongly suggested [a cerebral lesion with] cortical irritation. The presence of a new growth in the parietal lobe, however, could not account satisfactorily for the involvement of the fifth, seventh and eighth nerves and for the ataxia of the limbs and the staggering gait. Since all of these symptoms could be explained by assuming a tumor to be present in the left cerebellopontine angle, a suboccipital exploration was carried out, exposing the lesion.

When such spasms of the facial muscles are encountered, it is important to differentiate them from true Jacksonian convulsions, as they may easily be ascribed to cortical irritation.

### Nervi Acustici.

*Historical.*—After the second nerve Mingazzini found the eighth to be the most frequently affected cranial nerve in patients with cerebellar tumor. An impairment may be due to direct pressure on the nerve, to an infiltration of the trunk, to a tumor of the nerve sheath, or finally, perhaps, to pressure on the medulla or pons.

Extracerebellar as contrasted with intracerebellar growths are chiefly responsible for the symptoms arising from disturbances of the cochlea and labyrinth—impaired hearing, tinnitus, dizziness, impaired equilibrium, nystagmus, and tremor of the head. A unilateral or a bilateral deafness, when it appears for the first time as part of a brain tumor syndrome, is found almost exclusively in patients with tumors arising from the sheath of the acoustic nerve. Collier's experience, it should be mentioned, directly negatives the theory that auditory neuritis, in any way comparable with optic neuritis, occurs in intracranial tumors.

*Tinnitus,* as encountered by Stewart and Holmes, is of fairly frequent occurrence in recess tumors and is referred always to the corresponding ear. In tumors which involve the hemispheres it rarely forms a prominent symptom, and when present is vague in character and is not referred to either ear.

*Vertigo,* according to these observers, is one of the most constant symptoms of cerebellar new growths. In vermis tumors it appears early and endures over a long period (Bruns). This is readily explained by the intimate relations which exist between the vermis and Deiters' nuclei.

It is defined by Wilson and Pike [56] as the confusion resulting from the coming into consciousness of afferent impulses concerned with equilibrium which ordinarily are associated (integrated), but now for some reason have become dissociated. While vertigo, strictly speaking, is not a cranial nerve symptom, the ear is the most important of the peripheral organs which send such impulses afferentward, and any slight disturbance of the labyrinth results in a confusion of the patient's conception of his position in space. Moreover, pressure on the eighth nerve has been shown experimentally to be an important factor in the production of vertigo. In view of these facts and since such disorders of equilibrium were not discussed in a recent report on cerebellar coordination (Grey [29]), an analysis of this symptom has been included in this paper.

In both the intra- and the extra-cerebellar tumors, Stewart and Holmes have found that there is frequently a sense of displacement of external objects in front of the patient from the side of the lesion toward the opposite side. A subjective rotation of self, also frequently present, is always from the side of the lesion toward the healthy side in intracerebellar tumors, but from the healthy side toward the side of the lesion in extracerebellar tumors. Others, however, have failed to have this experience (Bruns, Oppenheim,[46] Weisenburg, Wilson and Pike [56]). Wilson and Pike have emphasized how difficult it is to get a distinct history of subjective sensations even from intelligent patients. In a case of Souques [55] with a recess tumor the subjective rotation was in a direction opposite to the rule mentioned above.

The disturbances of hearing and equilibrium recorded in the following analysis appeared for the first time in each case during the course of the illness which necessitated hospital admission.

*Unilateral Cerebellar Tumors* (24 cases).
- Hearing affected in neither ear: 14 patients.
- Hearing slightly impaired in homolateral ear: 7 patients.
- Hearing greatly impaired in homolateral ear: 2 patients.
- Hearing impaired in both ears: 1 patient—more homolateral.
- Tinnitus present—not referred to either: 4 patients.
- Tinnitus referred to homolateral ear: 4 patients.
- Tinnitus referred to contralateral ear: 4 patients.

*Median Cerebellar Tumors* (16 cases).
- Hearing affected in neither ear: 13 patients.
- Hearing slightly impaired: 2 patients—unilateral in one; bilateral in the other.
- Hearing greatly impaired: 1 patient—unilateral.
- Tinnitus present—not referred to either ear: 4 patients.
- Tinnitus referred to one ear: 2 patients.

*Cerebellopontine Tumors* (19 cases).
- Hearing affected in neither ear: 3 patients.
- Hearing greatly impaired in homolateral ear: 15 patients—in 1 the contralateral ear was also affected.

Hearing slightly impaired in homolateral ear: 1 patient.
Tinnitus present—referred to both ears: 1 patient.
Tinnitus referred to homolateral ear: 8 patients.
Tinnitus referred to contralateral ear: 3 patients.

*Median Tumors Inferior to the Cerebellum* (3 cases).

Hearing affected in neither ear: 2 patients.
Hearing slightly impaired in one ear: 1 patient.
Tinnitus referred to one ear: 1 patient.

*Vertigo.*

*Unilateral Cerebellar Tumors.* A careful study of vertigo was made in 13 patients with unilateral new growths. Of this number, 2 had never experienced any definite vertigo, 10 had suffered from it to a moderate degree, and 1 had been greatly troubled by it. With one exception no history of a displacement of external objects or of a subjective rotation of self could be elicited. The exception complained of the objects in his environment moving back and forth when he felt dizzy.

*Median Cerebellar Tumors.* Vertigo was studied in 10 patients of this group. Three had experienced very little if any real dizziness; 5 had been troubled with occasional vertigo, especially on changing from one position to another; and 2 had suffered much from it. Only one patient experienced any subjective displacement of external objects—the objects moved back and forth. There was no subjective rotation of self.

*Cerebellopontine Tumors.* Vertigo was studied in 13 patients with recess growths. Every one was found to have experienced some degree of dizziness. In 8 it was not a very troublesome symptom. In the remaining 5, however, it occasioned great annoyance. Two of the latter frequently suffered from a sense of displacement of external objects and a subjective rotation of self. In both the direction of the subjective rotation of self followed the rule laid down by Stewart and Holmes. But only one adhered to the rule pertaining to the movement of external objects. The second patient saw the objects move from the well toward the diseased side.

*Median Tumors Inferior to the Cerebellum.* Only one patient experienced any appreciable amount of vertigo. It consisted of a sinking feeling and frequently a subjective rotation of self from the healthy toward the diseased side.

*Comments.*—The observations recorded above indicate that in subtentorial new growths a unilateral impairment of hearing, which appears for the first time in company with general pressure symptoms, is indicative either of a homolateral tumor or, less frequently, of a median growth. When hearing, under similar circumstances, is greatly impaired or lost in one ear, it points toward a homolateral, extracerebellar localization of the tumor. Such a diagnosis is confirmed when either the fifth or the seventh nerve of the same side is also affected.

Tinnitus, it appears, is not a reliable guide to the site of a tumor situated below the tentorium. Even in recess growths it occasionally appears in the unaffected ear—as a rule, at some time subsequent to the perception of the noises on the diseased side. In such instances, particularly when the patient's memory is more or less hazy, the symptom may lead to erroneous conclusions.

Although vertigo is a prominent symptom of subtentorial tumors as compared with growths situated elsewhere in the brain, it has no appreciable significance, in the experience of this clinic, in localizing the disease in one or another part of the posterior cranial fossa.

For the purposes of neurological diagnosis we have found the Bárány caloric test to be of the greatest service in detecting impairments of hearing due to pressure on the auditory nerve. When a preliminary examination has ruled out any serious disorder of the meatus and the middle ear, this test furnishes a convenient and satisfactory method of gauging air conduction. Less reliance is placed upon bone conduction. While a shortened bone perception (positive Rinné) coupled with great deafness for speech indicates an affection of the auditory nerve, the perception of after-tones and the transmission of tones of the fork to the opposite ear interfere with the Rinné test. It occasionally happens that in patients with recess tumors, even of large size, the tones perceived by transmission in the unaffected ear are referred in part to the diseased side.

### Nervi Vagi et Glossopharyngei.

*Historical.*—Although cerebellar tumors, cerebellopontine growths in particular, may lie very close to the brain stem without leading to symptoms of bulbar involvement (von Monakow [27]), they not infrequently exert pressure on the medulla and give rise to disturbances of deglutition, of speech, and occasionally of the circulation and respiration.

The act of swallowing is carried out through the coordination of a system of buccal, pharyngeal, and œsophageal muscles. It is a reflex act, the afferent paths of which arise in the mucous membrane of the pharynx and œsophagus, including branches of the trigeminus, the glossopharyngeus and the vagus. The motor fibers concerned in the reflex arise from the V, IX, X, XI and XII cranial nerves. At the present time the deglutition reflex is thought to be controlled by a definite nervous mechanism, the final motor cells of which are scattered in the several motor nuclei of the afferent nerves just mentioned (Howell [28]).

While at least five motor nerves participate in the act of swallowing, a peripheral palsy of the IX or X cranial nerve, nevertheless, leads to some disturbance of deglutition. Extracranial disease of the vagus alone, however, as a rule leads to only a slight interference with swallowing. It is often impossible to determine to what extent dysphagia and dysarthria are due to an involvement of certain cranial nerves and to what extent to an involvement of the medulla. In cerebellar disease it seems probable that disturbances of mastication and deglutition at times arise through an incoordination of the involved musculature (Babinsky,[2] Rothmann, Mills and Weisenburg and others). According to André-Thomas,[1] the symptoms following the destruction of the cerebellum are, above all, disturbances of motility, whether the movement be reflex, automatic or voluntary.

Since speech depends upon an associative action of the respiratory, laryngeal, palatal and lip muscles, a dysarthria may result from the involvement of any of the nerves supplying these parts. According to Gutzmann,[22] the paralysis of one XII nerve leads to but a slight dysarthria. A bilateral paralysis, however, even incomplete, results in a marked disturbance of speech. Practically no interference with speech accompanies a paralysis of the motor division of the V nerve. The pronounced effects of an inactive facial nerve are well known—an interference with the labial sounds. Where the X nerve is

affected, the usual disturbances of phonation appear, due to the loss of innervation of the vocal cords. Such a paralysis (unilateral) leads not only to a laryngeal paralysis, but also to an involvement of the soft palate so that it does not move with speech.

The disorder commonly associated with cerebellar disease is described as being slurring and drawling, and at times scanning, jerky or a little explosive. This Babinsky and Tournay explain on the basis of hypermetria, adiadokokinesis and asynergy. Mills and Weisenburg believe in a true cerebellar dysarthria. Others, however, look upon such dysarthrias as chiefly bulbar in origin (Gutzmann). Bonhoeffer[8] and Meige[22] regard the drawling character of the speech encountered in cerebellar affections as due to a prolongation of the muscular contractions.

As Weisenburg[23] has pointed out, it is not generally recognized that the sensory distribution of the fifth and ninth nerves intermingle. It is presumable that irritation of either cranial nerve will cause pain to some extent in the distribution of the other.

*Unilateral Cerebellar Tumors* (25 cases).
Speech and deglutition normal (in history and on examination): 14 patients.
Deglutition alone affected (slight): 5 patients.
Speech alone affected (slight): 1 patient.
Deglutition and speech both affected (slight): 5 patients.
*Median Cerebellar Tumors* (16 cases).
Speech and deglutition normal: 15 patients.
Speech affected (marked): 1 patient.
*Unilateral Cerebellopontine Angle Tumors* (19 cases).
Speech and deglutition normal: 12 patients.
Speech affected: 7 patients—slight in 3 and marked in 4.
Deglutition affected: 4 patients—slight in 2 and marked in 2 (both of whom had marked dysarthria).
*Median Tumors Inferior to the Cerebellum* (3 cases).
Speech and deglutition normal: 3 patients.

*Comments.*—Dysarthria and dysphagia are two of the most striking symptoms of subtentorial new growths. They may appear both in patients with cerebellar lesions and also in those with tumors situated in the cerebellopontine angle. They are usually associated with considerable deformity of the medulla and pons. In the series reported here, these symptoms were encountered a little more frequently with recess growths. It seems likely that without surgical intervention all cerebellopontine tumors would ultimately lead to disturbances of deglutition and speech.

Though dysarthria and dysphagia are occasionally encountered in patients with supratentorial new growths we have come to regard them as very characteristic of intra- and extracerebellar tumors.

Nine in the series of patients reported here died with symptoms pointing toward respiratory failure. Here the compensatory changes in arterial pressure, which have been shown by Dr. Cushing[13] to act as a protective mechanism in such cases, were insufficient to counteract the effects of the marked cerebral compression. This probably led to the early depression of the respiratory center. (Horsley, and Dixon and Halliburton.[19]) The two most recent of these had been disturbed for several weeks previous to the exitus with slight difficulty in speaking, and for a number of days with some disturbances of deglutition. From these cases it appeared likely that the presence of dysarthria and dysphagia might prove to be of service as warnings of an impending respiratory embarrassment. Among the nine patients just cited, however, there were only three who had been disturbed with symptoms of this nature. In one there was no especial difficulty in swallowing, but speech was much affected. The other two were the recent cases mentioned above. Since six of the fatal cases had neither deglutition nor speech disturbances, and in view of the fact that 16 of the 19 patients that showed one or the other of these symptoms did not succumb to a respiratory failure, it is apparent that these features have no great significance as forerunners of a medullary paralysis, provided that decompressive measures are adopted within a reasonable time. When they are very marked, however, Dr. Cushing believes that they make surgical intervention hazardous. He has found that both may be greatly increased by manipulation and efforts to remove the tumor.

The dysarthria noted here was mostly of the thick, slurring, drawling type.

## NERVI ACCESSORII.

*Historical.*—Paralysis of the spinal accessory, a purely motor nerve, causes a complete paralysis of the sternocleidomastoid muscle, and a partial or very infrequently a total paralysis of the trapezius. Usually this is readily detected. Cerebellar new growths rarely lead to an involvement of the nerve.

In unilateral cerebellar disease a diminution of power is occasionally noted in the limbs on the side of the lesion. In the absence of sensory disturbances and atrophy it is thought by many to be due to the loss of the cerebellar control of the affected part (Luciani,[20] André-Thomas, Hunt,[21] Mills, and others). This asthenia is found in the distal and proximal muscles of the homolateral extremities and in the homolateral trunk muscles. A similar weakness of the muscles innervated by the spinal-accessory nerve, so far as can be ascertained, has never been reported.

*Unilateral Cerebellar Tumors* (25 cases).
Neither spinal accessory affected: 22 patients.
Homolateral muscles weak: 2 patients.
Questionable homolateral weakness: 1 patient.
*Median Cerebellar Tumors* (16 cases).
Neither spinal accessory affected: 16 patients.
*Cerebellopontine Tumors* (19 cases).
Neither spinal accessory affected: 18 patients.
Homolateral muscles weak: 1 patient.
*Median Tumors Inferior to the Cerebellum* (3 cases).
Neither spinal accessory affected: 3 patients.

*Comments.*—In the 63 cases reported here, a weakness of the muscles innervated by the spinal accessory nerve was found in but 3. In each instance there was only a moderate loss of strength and this was homolateral to the lesion.

In operating on tumors in the cerebellopontine angle we have frequently noted a twitching of the homolateral shoulder —an observation which points to the close proximity of the eleventh nerve to recess growths. A marked paresis or paralysis of the muscles innervated by this nerve in subtentorial tumors, however, is very rare in our experience. Dr. Cushing has seen only one such case.

### Nervi Hypoglossi.

*Historical.*—When the XII nerve is affected in its intracerebral course (paths from the cortex to the nucleus in the medulla), as is almost invariably the rule in hemiplegia, the tongue is protruded toward the paralyzed side, *i. e.*, toward the side opposite to the lesion in the internal capsule or cortex (Beevor [4]). No atrophy of the tongue appears. A paralysis of the peripheral nerve, however, results both in a paralysis and in an atrophy of the homolateral half of the tongue. It is only rarely that a weakness of the muscles innervated by the ansa hypoglossi is recognized. The peripheral twelfth conveys no form of sensation to the tongue (Maloney and Kennedy [21]).

True bulbar paralysis, as a rule, affects the roots of both hypoglossal nerves. This at first leads to a diffuse bilateral weakness of the intrinsic muscles, together with fibrillary twitchings, salivation and atrophy. During the early course of such a lesion the movements of the tongue are mostly preserved, but they are greatly slowed (Flesch [7]). A double hypoglossal affection of this type materially affects chewing and swallowing, and is rarely seen in cerebellar tumors.

When one-half of the tongue is paralyzed from an affection of the nucleus, root or nerve, there is an inability to touch the teeth and the gums or to protrude the tongue into the cheek of the paralyzed side, while there is perfect freedom of movement to the sound side, the tongue being easily protruded into the cheek of this side and the teeth and gums being readily touched. In advanced cases secondary atrophic changes in the paralyzed half may greatly interfere with the movements of the sound half (Mussen [20]). When the tongue is protruded, it deviates toward the side of the paralyzed nerve. An incomplete paralysis, however, may fail to cause any deviation of the tongue (Dinkler [6]).

In patients with cerebellar new growths, then, the tongue may deviate toward the normal or toward the diseased side depending on whether the new growth leads to pressure on the pons above the decussation (weakness of the contralateral limbs), or to an involvement of the peripheral nerve or its nucleus. Henschen [14] has reported a few cases of recess tumor with crossed paralysis.

Weisenburg [32] has reported a case of cerebellopontine tumor in which there were involuntary movements of the tongue. He believes that these spasms were unquestionably the result of irritation of the roots of the twelfth nerve.

*Unilateral Cerebellar Tumors* (25 cases).
Neither hypoglossal affected: 19 patients.
Homolateral hypoglossal weakness: 2 patients.
Contralateral hypoglossal weakness: 4 patients—a very slight disturbance in 2.

*Median Cerebellar Tumors* (16 cases).
Neither hypoglossal affected (16 cases).

*Cerebellopontine Tumors* (19 cases).
Neither hypoglossal affected: 14 patients.
Homolateral hypoglossal weakness: 2 patients.
Contralateral hypoglossal weakness: 3 patients—a very slight disturbance in 2.

*Median Tumors Inferior to the Cerebellum* (3 cases).
Neither hypoglossal affected: 3 patients.

*Comments.*—The muscles innervated by the hypoglossal nerves were found affected on one or the other side in 11 of the 63 cases. While the homolateral half of the tongue was weak in four, the contralateral half appeared to be affected in seven. It is important to note, however, that of the seven cases with muscular weakness on the side opposite the lesion, four showed only a very slight involvement. Minor differences of this sort might perhaps be explained in much the same way as are the corresponding normal asymmetries of the facial muscles.

From these observations it is evident that a weakness of the muscles innervated by one twelfth nerve is of very little significance for localizing tumors in one or another part of the posterior cranial fossa. A peripheral paralysis (involvement of the nucleus or nerve) accompanied by symptoms of increased intracranial pressure, of course, points toward a subtentorial localization of the growth.

In our experience an atrophy of the lingual muscles is rarely met with in cerebellar tumors.

### Summary and Conclusions.

Since anosmia in cases with intracranial tumor is usually a distant symptom due to a secondary internal hydrocephalus, it has no appreciable significance for the localization of the new growths. Uncinate gyrus symptoms may appear, secondary to an internal hydrocephalus. The sense of smell was affected in about seven per cent of the 63 certified cases analyzed in this report.

While choked disc in itself has no appreciable localizing significance, since it is not infrequently noted comparatively early in the course of certain supratentorial tumors, it may have some importance in this respect when it is associated with other signs. It is our experience that the early appearance and high degree of changes in the eye-grounds, when they appear in company with some of the so-called cerebellar symptoms, are important confirmatory evidence pointing toward a subtentorial localization of the new growth.

Very little reliance can be placed on an involvement of the third or sixth cranial nerve as a guide to the side occupied by the new growth, in the localization of tumors in one or another part of the posterior fossa.

The observations recorded here are in favor of the view held by many that the nystagmus seen in cerebellar disease is very frequently of cerebellar origin—an asynergy of the eye muscles. The rule which states that the nystagmus is slower and coarser with the eyes turned toward the tumor is subject to many exceptions. When, however, there is a definite and

persisting difference in the size and rate of the jerks with the eyes in the lateral positions, the nystagmus is usually suggestive of the side of the lesion.

Since impairments of conjugate deviation of the eyes are only infrequently encountered in the less advanced cases of subtentorial tumor, they have relatively little importance for the localization of tumors within the posterior cranial fossa. Skew deviation of the eyes in cerebellar new growths is rarely seen prior to operation.

In subtentorial tumors involvements of the fifth cranial nerve have no topographical importance in diagnosis (within the posterior fossa), unless the tumor lies in one or the other cerebellopontine angle. Such a localization is likely only when the homolateral eighth (or seventh) nerve is also affected.

A paresis or a paralysis of one facial nerve in tumors of the posterior cranial fossa is strong presumptive evidence of the side of the lesion, though a paresis appears not infrequently in median growths. When the eighth (or the fifth) nerve of the same side is also affected, the diagnosis of a homolateral growth may be made. A questionable involvement of the seventh nerve, on the other hand, is deceptive in this respect due, probably, to the relative frequency of normal facial asymmetries of slight degree.

In subtentorial new growths a slight unilateral impairment of hearing, which has appeared for the first time in company with general pressure symptoms, is indicative either of a homolateral tumor or, less frequently, of a median growth. When hearing, under similar circumstances, is greatly impaired or lost in one ear, it points toward a homolateral extracerebellar localization of the tumor. Such a diagnosis is confirmed when either the seventh or the fifth nerve of the same side is also affected.

Tinnitus, it appears, is not a reliable guide to the side occupied by a tumor situated below the tentorium.

Although vertigo is a prominent symptom of subtentorial tumors as compared with growths situated elsewhere in the brain, it has no appreciable significance for the localization of the disease in one or another part of the posterior fossa.

The presence of dysarthria and dysphagia (unless they are very marked) in patients with subtentorial tumors, though a source of anxiety, is no contra-indication to operation, since neither is a reliable sign of an impending respiratory paralysis. When they occur, they constitute two of the most striking symptoms of intra- and extra-cerebellar new growths.

The spinal accessory nerve is only rarely involved (in less than five per cent) in tumors of the posterior cranial fossa. When this nerve is affected, the muscular weakness is not marked and it is homolateral to the growth.

A weakness of the muscles innervated by one twelfth nerve is of very little significance for the localization of tumors in one or another part of the posterior fossa.

## REFERENCES.


1. André-Thomas: La fonction cérébelleuse, Paris, 1911.
2. Babinsky and Tournay: Les symtômes des maladies du cervelet et leur signification, Tr. Internat. Med. Congr., Lond., 1913, Sec. XI, Pt. 1, p. 1.
3. Bárány: Spezielle Pathologie der Erkrankungen des Cochlear und Vestibularapparates. Lewandowsky's Handbuch der Neurologie, 1912, III, 828.
4. Beevor: On the Movements of the Tongue in Hemiplegia. Brain, 1906, XXIX, 487.
5. Bonhoeffer: Ueber den Einfluss des Cerebellum auf die Sprache. Monatschr. f. Psych. und Neurol., 1908, XXIV, 379.
6. Bramwell: Localization of Intracranial Tumors. Brain, 1899, XXII, 1.
7. Bruce: The Localization and Symptoms of Disease of the Cerebellum Considered in Relation to its Anatomical Connections. Tr. Medico-Chir. Soc., Edin., 1898-99, XVIII, 85.
8. Bruns: Die Geschwülste des Nervensystems, Berlin, 1908, 171.
9. Collier: The False Localizing Signs of Intracranial Tumor. Brain, 1904, XXVII, 490.
10. Cushing: Strangulation of the Nervi Abducentes by Lateral Branches of the Basilar Artery in Cases of Brain Tumor. Brain, 1910, XXXIII, 204.
11. Cushing: The Sensory Distribution of the Fifth Cranial Nerve. Bull. Johns Hopkins Hospital, 1904, XV, 213.
12. Cushing: The Taste Fibers and Their Independence of the N. Trigeminus. Bull. Johns Hopkins Hospital, 1903, XIV, 71.
13. Cushing: Some Experimental and Clinical Observations Concerning States of Increased Intracranial Tension. Am. Jour. Med. Sc., 1902, CXXIV, 375.
14. Dinkler: Ein Beitrag zur Lehre von den Stamm- und Wurzellähmungen des N. hypoglossus. Deut. Zeitschr. f. Nervenh., 1898, XIII, 250.
15. Dixon and Halliburton: Cerebro-Spinal Fluid III. The General Effects of Increasing the Cerebro-Spinal Pressure. Jour. Physiol., 1914, XLVIII, 317.
16. Finkelnburg: Beiträge zur Symtomatologie u. Diagnostik der Gehirntumoren u. des chronischen Hydrocephalus. Deutsche Ztschr. f. Nervenh., 1901-1902, XXI, 438.
17. Flesh: Zur Neurologie der Zunge. Münch. med. Wchnschr., 1908, LV, 109.
18. Grey: Posterior Newgrowths without Nystagmus. Jour. Am. Med. Assn., 1915, LXV, 1341.
19. Grey: Staggering Gait, Limb Ataxia, the Romberg Test and Adiadococinesis. Jour. Nerv. and Ment. Dis., 1915, XLII, 670.
20. Grey: The Position of the Head and Suboccipital Discomfort. Ann. Surg., 1916, 129.
21. Grey: The Pointing Reaction and the Caloric Test. Am. Jour. Med. Sc., 1916, CLI, 693.
22. Gutzmann: Die Dysarthrischen Sprach-Störungen. Nothnagel, Suppl. 3, 1911, 265.
23. Homburger and Brodnitz: Zur Diagnose, chirurgischen Behandlung und Symtomatologie der Kleinhirngeschwülste. Mitt. a. d. Grenzgeb. d. Med. u. Chir., 1908, XIX, 187.
24. Henschen: Ueber Geschwülste der hinteren Schädelgrube, Jena, 1910.
25. Horsley: Brain, 1908, XXXI, 45.
26. Howell: Text-book of Physiology, 1913, p. 705.
27. Hunt: Dyssynergia Cerebellaris Progressiva. Tr. Am. Neurol. Assn., 1915.
28. Joliat: Exploration clinique du labyrinthe. Dernières acquisitions et vue d'ensemble. Rev. méd. de la suisse romaine, 1913, XXXIII, 736, 793.
29. Lasaren: Ueber eine Störung der Innervation des N. facialis bei Geschwülste der hinteren Schädelgrube. Neurol. Centralbl., 1914, XXXIII, 13.
30. Luciani: Das Kleinhirn. Ergeb. der Physiol., 1904, 2, Abt., 259.
31. Maloney and Kennedy: The Sense of Pressure in the Face, Eye and Tongue. Brain, 1911, XXXIV, 1.
32. Meige: Rev. neurol., 1907, XV, 312.
33. Mills, Frazier, De Schweinitz, Weisenburg, Lodholz: Tumors of the Cerebellum, 1905, New York.

34. Mills: Sensory Functions Attributed to the Seventh Nerve. Jour. Nerv. and Ment. Dis., 1910, XXXVII, 273, 355.

35. Mills and Weisenburg: Cerebellar Symptoms and Cerebellar Localization. Jour. Am. Med. Assn., 1914, LXIII, 1813.

36. Mingazzini: Pathogenese u. Symtomatologie der Kleinhirnerkrankungen. Ergeb. der Neurol. u. Psych., 1912, I, 89.

37. Monakow: Ueber Neurofibrome der hinteren Schädelgrube. Berl. Klin. Wchnschr., 1900, XXXVII, 721.

38. Muskens: (Quoted by Quix.) Lewandowsky's Handbuch der Neurologie, 1910, I, 977.

39. Musser: Note on the Movement of the Tongue from Stimulation of the 12th Nucleus, Root and Nerve. Brain, 1909, XXXII, 206.

40. Oppenheim: Lehrbuch der Nervenkrankheiten, 1913, pp. 915, 1195, 1384.

41. Oppenheim: Beiträge zur topischen Diagnostik der Gehirnkrankheiten. Mitt, a. d. Grenzgeb. d. Med. u. Chir., 1900, VI, 363.

42. Quix: Die Störungen des Geschmackssinnes. Lewandowsky's Handbuch der Neurologie, 1900, I, 959.

43. Redlich: Hirntumor. Lewandowsky's Handbuch der Neurologie, 1912, III, 603.

44. Rossbach: Ueber einen intraventrikulären Gehirntumor mit Areflexie der Kornea. München. Med. Wchnschr., 1909, LVI, 2168.

45. Rothmann and Katzenstein: Zur Lokalisation der Kehlkopfinnervation in der Kleinhirnrinde. Neurol. Zentralbl., 1911, XIX, 1146.

46. Souques: (Quoted by Mingazzini.) Ergeb. der Neurol. u. Psych., 1912, I, 89.

47. Spiller: Displacement of the Cerebellum from Tumor of the Posterior Cranial Fossa. Brain, 1911, XXXIV, 29.

48. Spiller: Loss of Emotional Movement of the Face with Preservation or Slight Impairment of Voluntary Movement in Partial Paralysis of the Facial Nerve. Am. Jour. Med. Sc., 1912, CXLIII, 390.

49. Stewart: The Diagnosis of Nervous Diseases. Lond., 1911, p. 133.

50. Stewart and Holmes: Symptomatology of Cerebellar Tumors. Brain, 1904, XXVII, 522.

51. Weisenburg: Diagnosis of Tumors and other Lesions in the Cerebellopontine Angle. Jour. Am. Med. Assn., 1908, I, 1251.

52. Weisenburg: Cerebello-Pontine Tumor Diagnosed for Six Years as Tic Douloureux. Jour. Am. Med. Assn., 1910, LIV, 1600.

53. Wernicke: (Quoted by Bruns.) Die Geschwülste des Nervensystems. Berlin, 1908.

54. Wilson and Pike: The Mechanism of Labyrinthine Nystagmus and Its Modification by Lesions in the Cerebellum and Cerebrum. Arch. Int. Med., 1915, XV, 31.

55. Wilson and Pike: The Differential Diagnosis of Lesions of the Labyrinth and of the Cerebellum. Jour. Am. Med. Assn., 1915, LXV, 2156.

56. Wilson and Pike: Vertigo. Jour. Am. Med. Assn., 1915 LXIV, 561.

# TREATMENT OF THE EMERGENCY CASES OF ECTOPIC PREGNANCY.

By Edward H. Richardson, M. D., F. A. C. S.,

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Thirty-five years ago extrauterine pregnancy was considered a surgical rarity, only an occasional case being observed even in the largest obstetric institutions of the world. Lawson Tait is credited with having been the first to perform a laparotomy for a ruptured tubal pregnancy in 1883. Since then our knowledge of this grave anomaly has been magnificently enriched both through its steadily increasing incidence and through the voluminous literature which its widespread study has produced.

So far from being a rare affection to-day, there can scarcely be found a general hospital of any size in the larger cities which is unable to report a dozen or more cases annually. The reason for this increased frequency is not altogether clear, although the suggestion that it may be explained through the spread and prevalence of gonorrhœa has much to support it.

A great deal of speculation has been indulged in concerning the etiology of ectopic pregnancy. The various theories advanced from time to time have one characteristic in common, namely, the fundamental idea of a mechanical factor, which suffices to arrest the fertilized ovum during its downward progress through the tube. A considerable variety of conditions has been definitely shown to thus operate in individual cases. These may be conveniently classified under three heads:

1. Conditions which obturate the lumen of the tube.

2. Congenital and acquired abnormalities of the tubal wall.

3. Conditions arising outside the tube by which its lumen is narrowed or obliterated.

Most of the conditions thus grouped represent isolated observations and are relatively rare. By far the most common specific cause of tubal pregnancy is the so-called "follicular salpingitis." As the name indicates, this is an inflammatory process in which the folds of tubal mucosa become œdematous and their free margins extensively adherent to each other in such a way as to form numerous little blind pouches or follicles in which a fertilized ovum may lodge. Indeed, this change may be so extensive as to give a reticulated appearance to a cross-section of the tube. While the absolute proof is lacking, one can scarcely resist the conclusion from the available evidence that this condition is brought about through gonorrhœal infection of the tubes. If the necessary proof is supplied through later work, it will thus be shown that the overwhelming majority of cases of ectopic pregnancy are caused by gonorrhœa.

Once the fertilized ovum becomes arrested in the tube from any cause whatsoever and begins to develop, it becomes a serious menace to the life of the individual.

A number of eventualities are possible both as regards the fœtus and the mother. We are concerned here, however, only with that large group of cases which terminate acutely either by tubal abortion or rupture prior to the eighth week of development, and are associated with an alarming degree of hemorrhage. These constitute the grave emergency cases which require the exercise of the nicest surgical judgment for their proper handling. The clinical picture is so typical that the diagnosis does not often present serious difficulties. The usual

story is that the individual prior to the onset of the attack was enjoying perfect health, oftentimes not even having experienced the early symptoms of pregnancy; that, while engaged in some commonplace activity, she was suddenly seized with a lancinating pain of agonizing severity in the right or left ovarian region, which promptly incapacitated her, and was rapidly followed by collapse. When seen an hour or two later by the physician, the condition of the patient is usually such as to excite grave apprehension. If she is conscious, the expression is anxious; the face and mucous membranes present a death-like pallor; there is either restlessness, associated with orthopnœa and air-hunger, or absolute quiet with complete relaxation of the voluntary muscles, and shallow, hurried breathing; the pulse is rapid and thready, and the blood-pressure subnormal; the skin is cold and clammy, and the temperature is often subnormal; abdominal tenderness and rigidity are marked, as a rule; and shifting dullness in the flanks is usually demonstrable.

With such a picture pelvic examination is unnecessary, and is apt to do positive harm by loosening a blood clot and exciting fresh bleeding.

The surgical problem in these cases is that of dealing with an acute, intra-abdominal hemorrhage in a patient partly exsanguinated and in a state of profound shock.

Gynecologists are not yet fully agreed as to the best method of dealing with this problem. Indeed, there still exist no less than three distinct schools, each advocating a method of treatment fundamentally different from the other two.

First, there is the radical school, whose teaching and practice are based upon the theory that, given a bleeding vessel in the pelvis, the indications are to clamp or ligate it at the earliest possible moment, irrespective of the patient's condition. They evidently do not believe in polytherapy, but prefer to concentrate their efforts with precipitate haste upon controlling the supposedly bleeding vessels. They, therefore, ignore for the time being the shock already existing, and through their ill-timed operative manipulations succeed handsomely in producing a far graver degree of shock, to the treatment of which, let us hope, they propose later to address themselves, provided the patient survives. As a matter of fact, the death of the patient relieves them of this necessity in from 40 to 50 per cent of the cases thus treated. Fortunately, this teaching is now subscribed to by a small and constantly diminishing number of operators.

Secondly, there is the school of ultra-conservatives, whose most conspicuous representative is Dr. Hunter Robb, formerly of Cleveland, Ohio. In 1908 he reported to the American Gynecological Society the results of a most interesting series of experiments, showing, among other things, that he had been unable to kill a dog by opening the abdomen, dividing bilaterally both the uterine and ovarian vessels, and then promptly closing the incision. When, however, after a half hour or so, he reopened the abdomen of an animal thus treated, and added operative manipulations to the shock already produced by the hemorrhage, the animal invariably succumbed.

Even more striking, perhaps, is his later report of 35 cases of tubal pregnancy treated by deferred operation. In five of these death seemed imminent on admission to the hospital. Not one of the patients was subjected to operation earlier than 18 hours after admission, and some were permitted to wait 12 days, the average time for the entire series being 5 days. Only one death occurred in the series, and this cannot justly be charged to the deferring of the operation.

This report naturally made a profound impression upon the minds of gynecologists the country over. Shortly after its publication, while serving my apprenticeship in the Gynecological Department of The Johns Hopkins Hospital, I had an opportunity of observing a patient treated as Dr. Robb recommends, the results of which led me to promptly reject his plan.

This patient, a robust woman in the prime of life, was admitted in the late afternoon to the private ward in a state of profound collapse from a tubal pregnancy that had terminated acutely a short time before. It was perfectly obvious that any operative procedure would certainly end her life. Accordingly operation was deferred, the measures advocated by Dr. Robb to combat the shock in these cases being promptly instituted, and with the most gratifying results. The improvement was almost immediate and continued throughout the night to such a degree that on the following morning she was considered practically out of immediate danger. The abdomen, however, soon began to distend, and within a few hours meteorism was the dominating feature of the clinical picture. She first suffered from hiccough; then, as the ileus gradually advanced, nausea and vomiting set in, together with a rapidly increasing pulse rate. Every possible measure to overcome the distention was employed by the gynecologist in charge of her, but without avail, so that about 48 hours after admission he was compelled to resort to laparotomy. The improvement following the operation was slight and only temporary, the patient dying two days later of intestinal obstruction.

The consensus of opinion of all who saw this patient was that had laparotomy been done and the large quantity of blood been evacuated from the abdomen as soon as the patient recovered from the initial shock, paralytic ileus would probably not have developed and her life might have been saved.

Probably similar experiences are responsible for the fact that few gynecologists can be found who subscribe to the deferred operative plan of the ultra-conservative school in the management of these cases.

Thirdly, there is the progressive school, which includes a substantial majority of the leading gynecologists of to-day. They believe neither in the precipitate haste of the radicals, nor in the dangerous delay of the ultra-conservatives, but, having appropriated valuable lessons from the experiences of each, they have incorporated them into a rational plan of treatment, which leaves little to be desired.

In this plan all therapeutic effort is first employed to combat the shock. It consists of the use of morphine hypodermically; the subcutaneous or intravenous administration of normal salt solution; when required, the employment of specific

cardio-vascular and respiratory stimulants; elevation of the foot of the bed; bandaging the extremities; and the application of heat externally. As soon as the improvement, which is almost sure to follow, has occurred, as indicated particularly by a slowing of the pulse rate, a substantial increase in pulse volume and blood pressure, immediate laparotomy with evacuation of the blood and removal of the affected tube is indicated. The operation need consume only 15 minutes, and the patient's condition will almost invariably be found better at the end than at the beginning of surgical intervention. I have employed this plan of treatment in nine of these grave emergency cases, and in all except one the results were eminently satisfactory, the convalescence and complete restoration to health being rapid and entirely uneventful in each instance.

The one exception was a case seen on January 19, 1916, in consultation with Dr. S. A. Dodds, of Walbrook, Md. This patient was a white married woman, 31 years of age. She had passed through two normal pregnancies, labors and puerperia, giving birth to two healthy children, aged respectively 7 and 6 years. Four years before she had had an abortion, followed by puerperal fever, and later by some minor gynecological operation—probably a curetment. During recent months the menstrual periods had been slightly irregular, one being 10 days overdue at the onset of this attack. Otherwise she was enjoying perfect health. About 10 a. m., immediately after defecation, she was seized with a pain in the right ovarian region of such violence that she sank to the floor and fainted. A little later, when Dr. Dodds arrived, he found her already in a state of partial collapse and, recognizing the nature of her trouble, he promptly instituted protective and supporting measures of treatment. She gradually responded to these sufficiently well to be removed to the Union Protestant Infirmary, where I saw her at 1.30 p. m. Her condition then was of such gravity as to preclude absolutely any immediate operation. I therefore at once resorted to the therapeutic measures detailed above, which had hitherto in my experience invariably rallied such patients sufficiently to enable them to withstand operation. To these she responded very promptly, but it was a disappointingly feeble response, so much so that at no time during the afternoon did her condition become such as to warrant surgical intervention. Towards the late afternoon she began to lose ground again very slowly, but quite definitely. I then determined to resort to a transfusion of blood as a preparatory measure for the laparotomy.

The necessary arrangements were promptly made and a direct transfusion was done by Dr. B. M. Bernheim.

The improvement in the patient's condition was almost instantaneous and truly remarkable, so that after the donor's blood had been allowed to flow over for only a few seconds, Dr. Griffith Davis considered her condition good enough to administer the ether, the transfusion being temporarily halted.

I then quickly opened the abdomen, evacuated a large amount of fluid and clotted blood, released extensive pelvic adhesions, lifted the uterus forward from extreme retro-displacement, and removed the right tube, which had ruptured near its middle. The right round ligament was then quickly sutured to the fundus in such a way as to both cover the raw surface at the cornu, and at the same time hold the uterus forward. The incision was closed without drainage, the entire operation having consumed less than 15 minutes.

While the incision was being closed Dr. Bernheim resumed the transfusion, allowing the blood to flow over until the patient had a good pulse and a striking improvement in the color of her face and mucous membranes.

She was returned to her room with a pulse of 108, and her convalescence from then on was entirely smooth and uneventful. She was discharged from the hospital on February 5, only 17 days from the time of her admission.

I have reported this case in detail for two reasons: First, because in a survey of the literature which has appeared since the transfusion of blood was revived and satisfactorily developed, I have been able to find reports of only 16 cases of extra-uterine pregnancy in which it was employed. Only six of these cases are reported in sufficient detail to determine the time relation of the transfusion to the laparotomy, and in none of these was it employed, as in my case, immediately prior to operating, for the specific purpose of converting a hopeless surgical risk into one of comparative safety. And, secondly, because it conclusively proves that in those exceptional cases where the usual methods of treatment fail we have in the transfusion of blood a possible life-saving measure.

I therefore unhesitatingly recommend that the necessary preparations for transfusion of blood be made as a routine in these cases, so that it may be promptly resorted to when the usual therapeutic measures fail.

## DISCUSSION.

DR. BERNHEIM: I hesitate to enter this discussion as to whether diagnosis in these conditions is simple or not, since I see but few of such cases. But in my experience, which is that of one engaged in transfusion work, death from acute hæmorrhage is not at all uncommon, although in the majority of cases there has been a time when supportive measures might have been instituted, that is, by the giving of blood. The patient referred to by Dr. Finney, which the chairman saw, a number of others had also seen. The case occurred at least five or six years ago and was the second transfusion to which I had been called. As Dr. Finney says, the diagnosis had not been made, although it was felt that there had been an intra-abdominal hæmorrhage. It was decided to operate on this patient and ascertain the source of hæmorrhage, stop the bleeding and then to transfuse. As I have said, it was the beginning of my transfusion work and I really did not know what was best to do in that particular case. So I occupied myself in trying to find a donor, the patient having no relatives or friends at the Union Protestant Infirmary. We found a man who was a cardiac case. He was about to be bled the next day because of his high blood pressure, which was around 180 mm. of mercury, and he readily agreed to give his blood. The patient's abdomen was hurriedly opened and the condition found to be one of extrauterine pregnancy. All manipulations were carried out with great rapidity and wonderful skill, but in spite of this a still further shock was caused. After closure of the abdomen we started to do the proposed transfusion. The method was much more complicated than it is to-day and when, after a good deal of labor and considerable time, we finally succeeded in getting the union, we were so pleased at having successfully accomplished it that we simply stood back and allowed the blood to flow over for about five minutes, at the

end of which time the patient was dead. The pressure of the donor's blood had over-distended the right side of the patient's heart, and since she was unconscious and we were inexperienced at transfusion work, we failed to recognize the signs of this condition, which are now so readily apparent to all engaged in transfusion work.

As I say, that case taught us a good deal: first, that all cases of extrauterine pregnancy are not so easy to diagnose, and secondly, that there is terrific danger in transfusion work in distending the right side of the heart, because of tremendous pressure on one side and almost negative pressure on the other side. In addition, it taught me that in cases of acute hæmorrhage, where operative interference is proposed, the time to transfuse is prior to and during the operation. That is, the patient must be brought out of shock first, before the anesthetic is given and before the slightest manipulation is started. Acting on that basis, we have done many other cases, not only of extrauterine pregnancy, but of other conditions where there has been acute hæmorrhage. In fact, the custom has developed that transfusion is started with the patient on the table and every preparation made for anesthesia and incision. With everything in readiness, the blood is sent over for about two or three minutes, during which time the patient is apparently resuscitated. When such a state of affairs takes place, the patient is anesthetized and the transfusion is stopped, because to raise the pressure in conditions of acute bleeding is simply to pump in and pump out at the same time. After the abdomen has been opened and the bleeding point caught, the transfusion is resumed, by which means the patient can readily be put into such shape that a normal convalescence may be confidently expected.

DR. CULLEN: I should like to differ slightly with Dr. Finney in regard to the question of the diagnosis in cases of tubal pregnancy. While in some cases the diagnosis is difficult or impossible, the clinical picture in the majority of the cases is perfectly evident. On referring to the clinical histories one finds that many of the patients have had a period of sterility extending over several years. Then they have missed one or two periods and have then noticed a slight continuous bleeding. Other patients have had a very short menstrual flow followed by a faint but constant uterine bleeding. Such a history instantly makes one suspicious of an extrauterine pregnancy. The only other condition that, as a rule, gives such a clinical picture is a chronic pelvic inflammation

Several years ago I reported in THE JOHNS HOPKINS HOSPITAL BULLETIN eight cases that had been observed in the course of a few weeks. In five of these the diagnosis had been made before the tube ruptured. We impress upon the students continually the importance of diagnosing these cases before rupture occurs. Fortunately in the vast majority of the cases the prodromal symptoms exist weeks before rupture occurs. In a few, however, these are absent, and in such cases the sudden pain in the right or left lower abdomen accompanied by pallor and collapse is the first intimation of the extrauterine pregnancy.

In those cases where tubal pregnancy is suspected, but where doubt exists, the patient should be etherized and a careful pelvic examination made. If doubt still exists, then the uterus should be curetted and the mucosa examined. In the early months of tubal pregnancy there is a sympathetic development of decidua in the uterine mucosa.

Accordingly, the finding of an intact mucosa with, at the same time, a transformation of the stroma cells into decidua, will clearly indicate the presence of a tubal pregnancy.

Several years ago Dr. G. Brown Miller of Washington saw a patient who had been sterile for years. This patient gave a history of missing one period; shortly after this there was a slight but continuous uterine bleeding. He examined the patient under ether, but could detect no abnormality in either Fallopian tube. He curetted the uterus and on examination of the mucosa we found an intact surface epithelium and a stroma consisting of typical decidua. Tubal pregnancy was diagnosed and the abdomen opened. The tubal pregnancy was scarcely 1 cm. in diameter and was unruptured.

I believe the time will come when nearly all cases of tubal pregnancy will be diagnosed before rupture occurs—at a time when the tube can be removed with little or no risk. In those cases where alarming internal hemorrhage has taken place, we must be prepared to transfuse before or during the operation.

# THE ETIOLOGY OF DISEASES OF THE CIRCULATORY SYSTEM.[1]

## (ABSTRACT.)

By T. C. JANEWAY, M.D.

This study of the diseases of the circulatory system, viewed from the standpoint of their etiology, was undertaken in the endeavor to determine whether there exists at the moment sufficient exact knowledge of the ultimate and of the contributory causes of any of the diseases of the circulatory system, to warrant the efforts which public health officials and life insurance companies are urging to reduce their prevalence. The diseases were considered in the following etiological categories:

1. Known bacterial infections:
   - (a) Bacterial or septic endocarditis.
   - (b) Other bacterial infections of the circulatory system.
2. Probable, but unproved, bacterial infections:
   - (a) The rheumatic infections.
   - (b) Benign endocarditis of other origins.
   - (c) Acute infectious myocarditis.
   - (d) Acute arteritis and phlebitis.
3. Syphilis:
   - (a) Of the aorta.
   - (b) Of the heart.
   - (c) Of the smaller arteries.
4. Rare infections.
5. Parasites and tumors.
6. Intoxications:
   - (a) Exogenous.
   - (b) Endogenous.
7. Nutritional disturbances.
8. Mechanical disorders.

[1] The Shattuck lecture delivered before the Massachusetts Medical Society, June 6, 1916.

9. Nervous disorders.
10. Defects of development.
11. Hereditary disease.

The study of syphilis was based upon an analysis of 2376 admissions to the Medical Service of The Johns Hopkins Hospital, September 21, 1914, to April 2, 1916, showing that of the individuals admitted 85.1 per cent were white, 14.9 per cent were colored. Of these patients, 8.8 per cent of the white and 37.6 per cent of the colored had a positive Wassermann reaction. Of the white 1.6 per cent, and of the colored 17.4 per cent had syphilis of the aorta, while 2.4 per cent of the white, and only 2.1 per cent of the colored had chronic endocarditis. A special study of the possible influence of syphilis in the causation of hypertension showed that, of 320 patients with hypertension during this period, 3.2 per cent of the white and 31.4 per cent of the colored had a positive Wassermann reaction, lower figures than for the incidence of the reaction in all patients of each race. When the patients with evident syphilitic lesions of the aorta or central nervous system, in addition to hypertension, were deducted, there remained only the following insignificant percentages in which a positive Wassermann reaction was associated with no evident clinical manifestations except the hypertension:

Hypertension with renal involvement:

| White. | Colored. |
|---|---|
| 0 | 13.5 per cent. |

Hypertension without evident renal involvement:

| White. | Colored. |
|---|---|
| 0.9 per cent. | 3.1 per cent. |

These figures lend no support to the view recently advanced by Stoll that family hypertensive cardiovascular disease is familial cardiovascular syphilis.

The influence of alcohol and of tobacco was studied in the author's series of private hypertensive patients; no convincing proof was obtained.

The relation of diabetes and gout to chronic nephritis and arteriosclerosis was similarly studied statistically; the incidence of past acute nephritis was found to be very small except for pregnancy nephritis in women. The etiological factors entering into the production of arteriosclerosis were also discussed.

Finally, the relative importance of the various causes of myocardial insufficiency was studied from an analysis of the 250 patients of the Hospital showing myocardial insufficiency during the above-mentioned period. The results were as follows:

One-third of our myocardial failures are associated with hypertension. As another large group of these patients die of apoplexy, hypertensive cardiovascular disease assumes first place as a cause of circulatory death. Chronic endocarditis stands next, with syphilis of the aorta just behind, each accounting for about one-sixth of the failing hearts. If we could add the deaths due to syphilis of the cerebral arteries, and to ruptured aneurysms, the position of syphilis and of the other infections would be reversed. The clinically primary myocardial insufficiencies, a motley group etiologically, but largely arteriosclerotic, follow with about an eighth of the blame. Emphysema and its congeners are not far behind, then true bacterial endocarditis, then thyroid intoxication, and various minor causes.

The following practical conclusions were drawn:

I. Reduction of the mortality from circulatory diseases is attainable.

II. The measures now possible, which will yield definite results, are, in the order of their importance and feasibility:
   1. The diminution of syphilitic infection and the early diagnosis and intensive treatment of primary syphilis.
   2. The further reduction in preventable infectious diseases, especially diphtheria, scarlet fever and typhoid fever.
   3. The education of the public to consider "rheumatism" a serious disease, particularly in childhood, and to seek competent medical advice at once; and the education of the medical profession to treat even the mildest rheumatic fever in bed with large doses of salicylates from the earliest possible moment.
   4. The provision of convalescent hospitals for the necessarily protracted after care of cases of acute inflammatory disease of the heart and of patients recovering from myocardial insufficiency.
   5. The development of suitable employments for cardiac patients, and of the social and economic machinery necessary for placing them in such employments.
   6. General hygienic measures, including the promotion of temperance.
   7. The medical examination of the supposedly healthy at stated intervals.

III. No large reduction of the mortality from circulatory diseases is likely until two groups of problems have been solved:
   1. The ultimate causes of hypertension and of chronic nephritis.
   2. The infectious agent of rheumatic fever and its portal of entry.

IV. The solution of these problems, if of such a nature as to lead to practical measures, with elimination of syphilis, would almost abolish disease of the circulatory system, except in the aged.

The need of the moment, therefore, is for more knowledge; not more knowledge of the dangers of circulatory diseases for the public, which means propaganda, but more knowledge of their causes for the physician, which means ceaseless investigation.


## JOHNS HOPKINS HOSPITAL BULLETIN.

The Hospital Bulletin contains details of hospital and dispensary practice, abstracts of papers read and other proceedings of the Medical Society of the Hospital, reports of lectures, and other matters of general interest in connection with the work of the Hospital. It is issued monthly. Volume XXVII is now in progress. The subscription price is $2.00 per year. (Foreign postage, 50 cents.) Price of cloth-bound volumes, $2.50 each.

A complete index to Vols. I-XVI of the Bulletin has been issued. Price 50 cents, bound in cloth.

# ON SOME OF PROFESSOR LEXER'S WORK AT THE RED CROSS AUXILIARY NAVAL HOSPITAL, VEDDEL-HAMBURG, GERMANY, 1914-1915.*

By MEDICAL DIRECTOR HENRY G. BEYER, U. S. N.

In venturing to speak to you to-day of some of the surgical work done by Prof. Lexer at the *Red Cross Auxiliary Naval Hospital* at Hamburg during the first eight months of the present European war, I would like to have it understood that I am impelled to do so from motives of a pupil's admiration for his master's work and that I have no intention of arrogating to myself the slightest credit in the work itself. My part is merely that of a propagandist and interpreter for which my association with him as his assistant has peculiarly fitted me. With the kind permission of Professor Halsted I would like to discuss with you the special subject of the "Operative Union of Fractured Bones, or Osteogenesis," to the literature of which Lexer, recently, has made important contributions and from which I shall draw freely.[1]

*Indications.*—The operative union of bony fragments is not called for in every form of fracture. Whenever the surgeon succeeds in securing an accurate coaptation of the bony fragments, in fresh fractures, especially of the tibia and femur, nothing besides a well-fitting plaster-of-Paris dressing will be required. The operative union of fractures of the shafts of long bones is indicated: in transverse fractures, in multiple fractures with intervening soft parts between the fragments, in cases in which two neighboring bones would form an unnatural union and where bony protuberances with important and powerful muscular attachments (olecranon, patella, calcaneus, trochanter major) have been torn off. There is at present no military hospital in Europe in which a very large percentage of time is not given up to the treatment of just such fractures.

*Time.*—Lexer advises waiting at least one week after the injury before attempting the operation. It is his opinion that the periosteum, as well as the soft parts surrounding the injury to the bone, must be given time to recuperate before they can be expected to take their full share in the production of the necessary callus.

The chief considerations in favor of an early operation are: (1) that the periosteum, torn from the surface of the bones, is more easily distinguished than after it has become embedded in thick and firm cicatricial tissue; (2) that the margins of the bony fragments can be more accurately fitted into one another; (3) that the early removal of bloody accumulations relieves the pressure upon the tissues, encourages the restoration of a normal circulation and nutrition in them and, at the same time, prevents the undue formation of adhesions between the soft parts, all of which would tend to a slow and imperfect formation of callus.

In all gunshot injuries it is safest to wait for the end of cicatrization, as the best granulating surfaces and the smallest granulating points still harbor infectious germs, seriously interfering with the process of healing. Imperfectly healed granulations, therefore, forbid the operation.

*Bony Splints Preferred.*—A firm and enduring position of the fragments of a long bone is best secured through splints placed either inside the marrow cavities or, externally, upon the surfaces of the shafts of the fragments. As material for internal splints (Bolzen) Lexer has for many years employed pieces of long bones freshly removed from either the same patient (autoplasty) or freshly amputated limbs (homoplasty) and prefers such material to any other, while admitting the usefulness of ivory, steel, silver and magnesium splints under certain circumstances. He uses the splints of a size sufficient to completely fill the marrow cavities and drives them, first, into one of the fragments with a few strokes of a hammer, and then, under extension, counter-extension and extreme flexion, slips the projecting end of the splint into the prepared marrow cavity of the other, finally pushing the margins of the fractured ends into the closest possible contact. In case the marrow cavity of a long bone should be found filled with callus, it is to be hollowed out by means of a sharp chisel. Boring it out electrically is to be avoided on account of the heat, thus produced, injuring the substance of the bone.

Even for purposes of external splinting Lexer prefers living bones to all other forms of splints. He says: "The union of bony fragments by means of living bone is for me the ideal to be pursued in all operative measures on fractures of the long bones, internally as well as externally. Freshly transplanted pieces of bone form an easy attachment to the surrounding soft parts and their blood vessels, thus promoting, instead of retarding, the formation of callus. Just as the external bony splints unite organically with the periosteal callus, just so do the internal bony splints (Bolzen) unite with the myelogenic callus." Another and not the least important advantage in the method of using living bone depends upon the fact that it can be used to replace lost bone, thus practically excluding shortening.

*Disadvantages of Foreign Material.*—Foreign material must first become encapsulated before organic union can take place with the bone. The development of callus and its transformation into bony tissue is consequently retarded, or even altogether prevented. These disadvantages may not become so apparent where foreign material is used for intramedullary splinting, because the periosteal callus grows over the fractured portion and unites the ends of the fragments. But even

* Address made at The Johns Hopkins Hospital, May 17, 1916.

[1] Lexer, "Blutige Vereinigung von Knochenbrüchen." Deutsche Zeitschrift f. Chirurgie, Band 133. Kriegschirurg. Mitteilungen aus dem Völkerkriege, 1914-15.

here Lexer has reported frequent failures, occasioned by post-operative myelitis, induced by the presence of these foreign bodies. In cases in which metal, ivory, horn, or boiled bone from cadavers, was used, suppuration as late as a year after operation has been known to occur and compel the removal of the offending substance. These disadvantages are, according to Lexer, eliminated when living bones are used as internal or external splints. Subsequent suppuration in such cases is due, in his opinion, to faulty technique and not to the splints employed.

*Important Relation of Soft Parts to Periosteum.*—Lexer considers it a very serious error to separate the soft parts from the ends of the fragments in the wound and from the periosteum adherent to the already formed callus covering the bone. Such a procedure damages the reproductive functions of the periosteum very greatly, as may be seen at once when its blood supply is taken into consideration: The diaphysis of a long bone receives its blood supply through the nutrient artery. The metaphysis and epiphysis receive theirs from the vascular networks of their respective joint-capsules, while the periosteum depends for its blood supply exclusively upon the soft parts immediately surrounding it. That portion of the blood supply which comes to the periosteum from the bone-marrow through anastomoses in the cortical substance is diminutive, when compared with that received from its connections with the soft parts immediately covering it on the outside. All reproductive power of the periosteum as, also, that of the endosteum, depends upon new formation of blood vessels.

Quoting from Lexer: "If we produce, subcutaneously, fractures in animals and, later, at intervals (1-6 weeks), inject into the blood vessels a turpentine-quicksilver emulsion, so as to render these visible in the roentgenogram, it will be easy to observe a gradually increasing new formation of blood vessels, not only near the seat of the fracture, but also in the neighboring portions of the fractured bone. This new formation of blood vessels becomes noticeable about one week after the fracture and continues to increase well into the fourth week of callus formation, but then gradually subsides. This newly formed blood-vascular supply takes its origin in the periosteal network of capillaries and *not* in that of the nutrient artery. This artery is torn and therefore may cooperate, though very slightly at first, through anastomoses with the periosteal network of vessels and, later, through the production of new vessels of its own. Callus formation having come to an end, all the vessels resume their normal appearance, so that at the end of the sixth week scarcely a difference is noted between the fractured and its corresponding uninjured bone."

For Lexer it has become a firmly established fact that the lion's share in the process of the repair of a broken bone is contributed by the periosteum, through its increased blood-vascular growth greatly assisting in the formation of callus and, thus, of new bone. Hence it follows that during all operations for the union of fractures the periosteum must, first, never be separated from its connection with the soft parts while the fragments are being exposed, and, secondly, laceration of the periosteum itself must be guarded against. These same principles underlie the formation of the sequestrum after an osteomyelitis. Here the nutrient vessels have become thrombotic or have been partly destroyed in the suppurative process. The periosteum remaining adherent to the soft parts, wherever its vessels have survived, there also promptly begins the formation of the sequestrum.

In gunshot injuries received at close range, where even undeformed bullets produce an explosive effect, large tracts of periosteum remain adherent to the surrounding soft parts, a fact of great significance and to be taken advantage of in bone transplantations. Even the largest defect, an entire diaphysis or section of skullbone, may be replaced by bones of any sort or source, whether it be living periosteal or dead bone, whether of autoplastic or of homoplastic origin; even foreign substances, as ivory, metal or horn, may thus be used with perfect clinical success, *as long as the periosteum in the wound remains intact and in connection with the soft parts.*

Moreover, whenever we are confronted with the problem of having to replace a large bony defect we shall be successful only when the freshly obtained, periosteum-covered bone-transplant finds rapid contact with the surrounding soft parts, that is, when placed in such a position that primary agglutination can occur. If this organic fusion fails to materialize, being prevented by hæmorrhage or inflammatory exudates, the transplant is doomed to die and can never be expected to replace the lost bone. The first and foremost function of the periosteum, adherent to the transplant, is that it facilitates a close attachment to the soft parts. Its specific callus-forming function follows as a secondary event in the process of repair. Freshly obtained transplants from the same subject, covered with uninjured periosteum, give the best results.

*Causes of Failures.*—What constitutes the chief cause of a break of a transplant, whether placed internally or externally, at the seat of the fracture? Always an erosion of the transplant by granulations that destroy the cortical substance after the disappearance of the periosteum. Connective tissue, rich in blood vessels, always appears in those places in which blood has accumulated between the transplants and the soft parts surrounding them; where, in other words, the close contact between the two has failed to occur. With intramedullary splints this sometimes happens where the ends of the fragments have not been freshened sufficiently or where a too prominently projecting tooth has interfered with the accurate coaptation of them. A dead space is thus left, exposing the transplant between the two ends of the fractured bone. This space is first filled with blood and afterwards with connective tissue, the destructive activity of which progresses *more rapidly* than the reparative, callus-forming activity of the periosteum.

Exactly identical conditions would be met with in cases in which transplants are used for the purpose of replacing defects in long bones to prevent shortening, as well as to assure a firm position of the fragments, were it not for the fact that in all such cases transplants, protected by their own periosteum, are here used. All that remains to be done here is to provide such

conditions as will assure the close contact between the soft parts and the periosteal surface of the bone-transplant.

*The Operation.*—A deep incision is made down to the bone. The soft parts, *including all the cicatricial tissues and periosteum*, are gently pushed aside. The bared ends of the fragments are lifted out of the wound, the walls of the wound cavity are then carefully freed from the cicatricial tissue, care being taken to avoid as far as possible any injury to the periosteum. The latter is easily recognized by the presence in it of thin layers of callus or by its color alone, which differs somewhat from the whitish appearance of the cicatricial connective tissue. When this procedure is carried out, large tracts of living periosteum remain in vital connection with the soft parts, on the one hand, while the removal of the cicatrices from the walls of the wound facilitates the new formation of blood vessels between it and the bony surface on the other.

*Source of Splints.*—In all operations for the union of broken bones, by means of living bone transplants, the source of the transplants is of paramount importance. For short splints, pieces of rib from the same patient, the outer sides of which have retained their periosteal covering, are the simplest material that can be employed. Longer splints had better be taken from the periosteum-covered spine of the tibia: A long, slightly convex, incision is made through the skin on the outer side of the spine of the tibia; the tibialis anticus is gently pushed aside outwardly, until the external surface of the tibia lies, everywhere and to the extent of about 2 cm., freely exposed. After the periosteum on both sides of the spine has been incised and the desired length and breadth of the future transplant has been marked out, a narrow groove is cut along the whole line of the periosteal incision into the cortical portion of the tibia by means of a fine V-shaped chisel. This circumcised plate of bone is then easily chipped off by inserting the sharp end of a wide, flat, thin chisel into this groove and driving it in with a few light strokes of a hammer at different places as well as at both extreme ends of the line of the incision, until the plate separates from the underlying bone. Even long plates do not splinter when broad and rather thin chisels are used that are sharp on both sides. Electrical saws must be avoided.

The plate of bone thus removed is at once wrapped up in sterile gauze soaked in warm normal salt solution and kept until used.

In fractures of the long bones in which the transplants are to serve not only the purpose of securing a firm position between the fragments but also that of replacing lost sections of bone, Lexer does not recommend the employment of external splints, notwithstanding the fact that he has used these successfully on the lower jaw. For intramedullary splints (Bolzen) Lexer employs homoplastic material, when available, of the thickness of the entire fibula, ulna, radius or long strips of the femur or humerus, occasionally also metacarpal and metatarsal bones. As autoplastic material the fibula alone comes into consideration whenever the "Bolzen" are to serve exclusively for giving the fragments a firm position and, consequently, need not be covered by periosteum. The regeneration of the fibula begins after the third or fourth week of its removal from the sleeve of periosteum left in the wound cavity.

*Points Deserving Special Attention.*—Esmarch's bandage should never be employed, since the hæmorrhage in the wound must be most carefully controlled by the ligation of all bleeding vessels in order that the wound may be closed perfectly and tampons and drainage tubes avoided. Broad hooks covered with sterile gauze will prevent injury to the tissues. Incisions over bones lying directly under the skin must be curvilinear, so that the skin-cicatrix shall remain free from connection with the bone. Whenever it becomes necessary to proceed cautiously and to have regard for important anatomical structures, before making incisions down to the bone, the tissues are divided layer after layer. Such a procedure is called for in the arm on account of the radial nerve, in the forearm on account of both the tendons and nerves. After thus reaching the last layer of connective tissue over the periosteum the knife is carried down to the bone through both. In the case of a fractured femur that is covered with a very thick musculature, smooth wounds are very desirable. Here the knife is made to enter on the outer side of the thigh and pushed straight through until its point touches the bone. The tissues are slowly divided, the point resting steadily on the surface of the fragments. The knife, having reached the seat of fracture, sinks in deeper, passing on to the second fragment. The periosteum, as well as any possible callus, having been divided throughout, a broad elevatorium is introduced and both are pushed aside.

The free end of the fragments appearing at the bottom of the deep wound are now seized with strong bone forceps and slowly drawn out, while strong flexion is maintained between the fragments to assist in this act. In fresh cases the bloody coagula collected behind the fragments are pressed out of the wound. In the older cases the still adhering periosteum and masses of callus are pushed off from them, so that they may remain at the bottom of the wound and retain their connection with the soft parts unimpaired.

The next step is to search the surfaces of the wound for old cicatrices. These are found mostly over places where the periosteum has been destroyed or where torn pieces of muscular tissue have covered the bony stumps. Such tissue has a whitish appearance and bleeds but little. Finally adhering bony splinters had better be left, providing they exert no noticeable pressure on important nerves and do not tend to produce bony union between two neighboring bones. Even projectiles or portions of them may be left undisturbed when their removal would be attended by injury to the periosteal vessels.

The next step in the operation consists in the preparation of the stumps. In transverse fractures it is usually considered sufficient to saw off a thin disc. In irregular oblique fractures, where tooth-like projections are desirable for dovetailing the ends of the fragments into one another, a fine sculptor's chisel best serves the purpose of freshening the stump. The marrow cavities must be cleared out so as to make the splint fit snugly. At this stage of the operation the fragments are replaced to the bottom of the wound, bleeding vessels are ligated, the cavity is packed with hot salt-compresses to arrest and to absorb

the results of capillary oozing. An examination of the condition of the fracture having, moreover, resulted in giving the necessary information as to what sort of a splint is needed, whether it is to be covered by periosteum or not, the required transplant is sought and introduced into the prepared marrow cavities of the stump. Supposing this to be a fracture of the femur, the splints being taken from the fibula, being about 10 cm. long, the first half is driven into that fragment which was broken off transversely, or nearly so. The end of the splint projecting from this fragment can, naturally, not be introduced into the other by extension and counter-extension alone. We must, in addition, make use of strong flexion ad axin and pull the stumps apart by means of strong bone forceps before we shall succeed in slipping it into the marrow cavity of the remaining fragment.

In fractures of the leg and forearm in which but one bone has been fractured, flexion is, of course, out of the question. In such cases it becomes necessary to chisel out a narrow piece from the second fragment in order to enable the operator to place the projecting end of the bolt into its cavity. In all such cases wiring is also necessary.

*The Closure of the Wound.*—Suturing of the soft parts begins close over the bone with fine catgut. Periosteum must lie snugly over the bone and all around it. On the femur, from 4-6 such sutures, one over the other, are necessary. If muscles, tendons and nerves have been displaced during the operation they are returned to their normal position after the first periosteal suture has been completed and kept there by sutures, if necessary. In this manner, muscles, fascia and fatty tissues are united with continuous catgut suture, and, lastly, the skin with silk.

After the skin has been cleansed with peroxide of hydrogen, silver leaf is spread over the suture and its immediate neighboring skin surface, according to the method of Halsted (on which method Lexer made a special report in the "Zentralblatt f. Chir.," Nr. 14). A fenestrated plaster-of-Paris dressing is used for the leg, a pasteboard splint for the arm. These dressings remain undisturbed for at least three weeks, providing all goes well, the fragments show perfect coaptation and the limb is in the correct position.

Finally, and in order to complete this account, a few words must be added with regard to the preparation of the field of operation. Lexer rejects the employment of tincture of iodine in every aseptic operation. He says: "Useful as may be the painting with tincture of iodine in emergency cases and in suppurative cases, it accustoms the entire personnelle to merely superficial cleanliness, a cleanliness that is insufficient for all operations in which absolute aseptic conditions must prevail. In wounded who have little or no opportunity for bathing for weeks or months, over places where the hardened and dried epithelial scales have peeled off and have been pushed into a fresh wound, leaving the undisinfected skin surface exposed; in these cases our tincture of iodine cannot give us the security from infection which we require."

# THE SUPERSTITION AND FOLKLORE OF MENSTRUATION.

By Emil Novak, A. B., M. D.

From the very earliest times the phenomenon of menstruation has been the subject of much speculation and study. In view of the many advances which have been made in our knowledge of other gynecological problems, therefore, it is rather surprising to note how little of a definite nature has been learned as to the cause and significance of this manifestation.

The history of our knowledge of this subject reflects in an interesting way the changes which have been gradually brought about in our methods of studying such problems. The earliest ideas as to the nature of the menstrual process represent a curious blending of speculation and superstition, with very little foundation of real fact. The element of mystery in the phenomenon seems to have inhibited intelligent efforts to study it. Apparently, there was a general acceptance of the depressing dictum later enunciated by Colombat "The mystery of menstruation will be forever covered with a veil that cannot be completely removed." On the other hand, it is gratifying to note that the scientific methods of our own generation have already yielded splendid additions to our knowledge of this problem. Much has thus been done to dispel the numberless superstitions which formerly befogged the subject in the minds of both the laity and the profession.

Many of these old beliefs concerning menstruation are of interest, and I have thought that it might be well worth while to gather some of them together and present them in this brief paper.

Even before the time of Hippocrates, menstruation seems to have been looked upon as a cleansing process—a periodic purging of the blood from filth and impurity. The very name given by the Greeks to the process of menstruation (*κάθαρσις*, catharsis) is indicative of this belief in the cleansing function of the menstrual flow. It is still the popular conception among the laity, and, perhaps, among a certain proportion of the profession. The disagreeable odor of menstrual blood may be in part responsible for this belief.

Pliny speaks of the menstrual blood as being "a fatal poison, corrupting and decomposing urine, depriving seeds of their fecundity, destroying insects, blasting garden flowers and grasses, causing fruits to fall from branches, dulling razors, etc." (Lib. VII Cap. 15.) He also states that the dog that licks menstrual blood becomes mad, although, curiously enough, as we shall see, menstrual blood was later recommended as a cure for the bite of a mad dog. He says, further: "If a woman strips herself while she is menstruating and walks round a field of wheat, the caterpillars, worms, beetles and other vermin will fall off from the ears of corn. Metrodorus,

of Scepsos, tells us that the discovery was first made in Cappadocia, and that, in consequence of such multitudes of cantharides being found to breed there, it was the practice for women to walk through the middle of the fields with their garments tucked above their thighs; that in other places, again, it was the usage for women to go barefoot, with the hair dishevelled and the girdle loose. Due precautions must be taken, however, that this is not done at sunrise, for, if so, the crop will wither and dry up." Astruc is another author who speaks of the ancient belief that the menstrual discharges were so venomous that "they withered and dried up the flowers, marred liquors, tarnished looking-glasses, with several other astonishing effects."

According to Pliny, bees are said to have an especial aversion to a thief and to a menstruating woman, a glance of such a woman's eyes being sufficient to kill a swarm of bees. Horses are also susceptible to this malign influence. "A mare big with foal, if touched by a woman in this state, will be sure to miscarry; nay, even more than this, at the very sight of a woman, though seen even at a distance, should she happen to be menstruating for the first time after the loss of her virginity, or for the first time while in a state of virginity. So pernicious are the properties of the menstrual discharge that women themselves, the source from which it is derived, are far from being proof against its effects. A pregnant woman, for instance, if touched with it, or if, indeed, she so much as steps over it, will be liable to miscarry."

Such beliefs are responsible for the abhorrence in which the menstruating woman was universally held. This is well exemplified in the Mosaic law: "And if a man shall lie with a woman having her sickness, and shall uncover her nakedness, he hath discovered her fountain, and she hath uncovered the fountain of her blood, and both of them shall be cut off from among their people" (Lev. XX, 18). The menstruating woman was held to be unclean for seven days, at the end of which time she sacrificed turtle-doves as a burnt offering.

Coitus at such a period was looked upon as a very grave offense. In ancient Persia the persons guilty of such an act were devoted to the fires of hell until the day of Judgment. The Zend-Avesta is full of regulations tending to isolate "unclean" women, while metrorrhagia is condemned as a crime punishable with one hundred strokes of the lash. It is said that even among modern Greeks menstruating women are denied communion in the church and are forbidden to kiss the church pictures (Ploss). The Bible makes frequent mention of menstruation, though usually in paraphrase. The word "menstruous" is employed three times, and always in the sense of unclean and repellant, as when Jeremiah says, "Jerusalem is as a menstruous woman among them."

History tells us, furthermore, that by a decree of the Council of Nice women were forbidden to enter church while menstruating, so that evidently it was not only the ignorant who entertained these peculiar notions of the uncleanness of women during menstruation. It is even said that certain surgeons would not allow menstruating nurses to assist in operations.

German peasants, according to Ploss (Das Weib, 1884), believe that, if a menstruating woman enter the cellar, she turns the wine of the Fatherland sour, and that if she crosses a field she spoils the growth of the vegetation. The humbler class of Jewesses are accustomed to signal their menstrual period to their husbands by a curious ritual observance. They tie bows of blue ribbons to their beds or chairs. Similarly, negresses in certain parts of Africa wear a scarf of glaring color folded three corner-wise over the bosom during the menses. Along the Congo River the "house of blood," a hut daubed with red clay, is used for the purpose of segregating the tribeswomen of each village when in this condition (Knott).

The negresses of Surinam must also, according to Ploss, live apart from their tribes during the menstrual periods. Moreover, when anyone approaches them they must call out "Mi kay! Mi kay"! "I am unclean! I am unclean." The same author also, in his monumental work, "Das Weib," gives innumerable other examples of this almost universal belief which exists among savage and barbarous peoples. A few other examples from Ploss may be cited of this remarkable taboo put upon the menstruating woman.

In Angola the women are obliged to wear a bandage about the head during the period of menstruation. If menstruation persists beyond this time, the woman is considered to be under the influence of evil spirits, and is punished with one hundred lashes of the whip.

Certain tribes believe that the process is dangerous, not only to others, but to the menstruating woman herself, and so they enforce a strict dietetic regime at that time.

Among the Tinneh Indians, according to Frazer, it is dangerous for a menstruating girl to touch her head with her hand. If she finds it necessary to scratch her head, this must be done with a stick. Among some tribes she is not even allowed to feed herself, and among others she is obliged to wear, hanging from her forehead, a fringe made of shells or bones. The purpose of this is to cover her eyes, as she is especially susceptible to the influence of malicious sorcerers at this time (Crawfurd). Among certain races menstruating women are forbidden to eat anything that bleeds, as this would increase the severity of the flux in the transgressor. Among the Persians the women likewise are segregated at the time of menstruation. The usual period of isolation is four days, the maximum is nine days.

The Indian women of the Orinoco country in South America are obliged to fast during each menstrual period, while among the North American tribes the squaws are sequestered in separate huts during menstruation. According to Colombat, the Illinois Indians punished with death any of their squaws who failed to give notice that they were affected by the periodic discharge. In the same way Crawfurd mentions the case of an Australian black who killed his wife because she had lain on his blanket while she was menstruating. He himself is said to have died of terror within a fortnight.

Among some of the Hottentot tribes the women are made to paint their faces with a spectacle-like design at the time of menstruation. Many savage tribes believe that if a man by

any accident comes upon menstrual blood he will be unlucky in warfare and in all other undertakings.

Ploss quotes a work by Eckarth, published early in the 18th century, in which the virulence of the menstrual discharge is illustrated by the statement that, unlike other blood, no amount of washing can remove entirely the stain it produces upon cloths. The same author says that, if a menstruating woman looks into a mirror, the latter will forever be marked by two round defects corresponding to the eyes of the woman. This is similar to the statement of Aristotle that, if a menstruating woman looks into a mirror, not only is the polish lost, but the person who next looks into the mirror will be bewitched. Pliny, speaking of this tarnishing effect on mirrors, says that the polish can be restored by having the same woman look steadily upon the back of the mirror.

Another interesting group of superstitions has to deal with the influence of the menstruous woman upon milk and the milk supply. According to Frazer, the Kaffir woman of South Africa is not allowed to drink milk during menstruation. If she does, the cows from which the milk came will die. The same custom prevails among the Bahimas. Exception is made, however, in the case of the young girl with her first menstruation. An old cow, of small value, is set aside for her use. The underlying belief in these cases is obviously that there is a sympathetic bond of some sort between the cow and the milk, and that any injury to the latter affects the cow also. A menstruating woman is even forbidden to cross the pasture, for if a drop of menstrual blood were to fall on such a place, any cow passing over it would be apt to become diseased and die.

Columella, Graaf, and Verheyen, as well as a number of the old Arabian authors, have likewise attributed those noxious qualities to the menstrual blood (Columbat). According to Moreau de la Sarthe, in his "Hist. Nat. de la Femme" (t. 2, 261), the negroes of the South Sea Islands and the aborigines of South America send their females into separate huts and keep them absolutely sequestered during the whole of the menstrual period. Some savage tribes in Africa distinguish by a red flag those huts which contain menstruating women. The color of the flag is evidently suggested by the color of the menstrual discharge.

An old author, Guarinonius, sums up these superstitions in the following rhymed rules of conduct for menstruating women:

**Die Töchter lass nicht unter d'Leut, noch Hochzeit noch Tanz,**
**Die Verehelichten mercken besonders auf ihre Schantz,**
**Damit sie zu wehrender Blumens Zeit**
**Von ihren Männern sich schrauffen weit,**
**Nicht greinen, nicht zürnen, nicht schlagen umb,**
**Sonst schlägt das Gift in d'Glieder, und werden krumb,**
**Die jungen Kinder nicht viel küssen noch berühren,**
**In der Kuchel die Speise nicht selbst anrühren,**
**Nicht in die Keller noch zum Weinfass gehen,**
**In Gärten umb die jungen Bäumblein auch nicht stehen,**
**In keinen reinen Spiegel hinein sehen,**
**Daheymbs still sitzen, dafür nehen,**
**Sich sonsten auch gar wol verwahren,**
**Das leinen Tuch hierinn nicht zu fast sparen,**
**Damit nicht das unwissend Haussgesinde,**
**Das Gspor der Kranckheit auf dem Boden finde.**

Similar, in spirit at least, are the old lines quoted by Havelock Ellis:

> **Oh! menstruating woman, thou'rt a fiend,**
> **From whom all nature should be closely screened.**

Not all the older writers, it must be mentioned, participated in the view that the menstrual blood was poisonous. Aristotle believed it to be "as pure as that which flowed from any wound." Hippocrates compared it with that of a slaughtered victim ("Sanguis autem, sicut a victima, si sana fuerit mulier"). John Freind, in arguing against the prevalent theory of the noxiousness of the menstrual blood, asserts that the latter cannot be impure, "inasmuch as it is not secreted by the help of any gland, but breaks forth from the capillary arteries, and therefore retains the nature of the arterieous, *i. e.*, the most pure blood."

Although such superstitions as we have been discussing are not so common as they were formerly, they are far from being thoroughly rooted out, even in our own day. Ellis speaks, for example, of the regulations still in force in the sugar refineries of northern France, whereby women are forbidden entrance during the boiling or cooling of the sugar, since the proximity of a menstruating woman would cause the sugar to blacken. Dr. Howard A. Kelly tells me that women are not permitted to enter the silver mines in Mexico, as a menstruating woman would cause all the silver to disappear from the veins of metal. For similar reasons no woman is employed in the opium industry at Saigon, it being said that the opium would turn and become bitter if a menstruating woman were near.

To show that even the medical profession of modern times is not quite free of the influence of such superstition, Ellis quotes several letters written to the *British Medical Journal* as late as 1878. The writer of one, a member of the British Medical Association, asked whether it were true that if a woman cured hams while menstruating the hams would be spoiled. He had known this to happen twice. Another medical man wrote that, if this were so, what would happen to the patients of menstruating women physicians? Still a third wrote (*British Medical Journal*, April 27, 1878): "I thought the fact was so generally known to every housewife and cook that meat would spoil if salted at the menstrual period, that I am surprised to see so many letters on the subject in the *Journal*. If I am not mistaken, the question was mooted many years ago in the periodicals. It is undoubtedly the fact that meat will be tainted if cured by women at the catamenial period. Whatever the rationale may be, I can speak positively as to the fact."

Knott also speaks of the prevalence of a singular superstition in certain rural communities in England (Essex and Worcestershire), where menstruating women are believed to have the power of "measling" meats. Laurent, again, mentions a number of modern instances in which mysterious influences were attributed to the menstruating woman—the case of the orchestral performer on the double bass who noticed that, whenever he left a tuned double bass in his lodgings during his wife's period, a string snapped; that of the woman harpist who was obliged to give up her profession because at

her periods the strings of her harp, and always the same strings, broke; the cases in which women at this period notice the supposedly spontaneous breakage of glasses, the stopping of clocks, etc.

Many other such superstitions might be mentioned—the belief in the poisonous effect of menstrual blood upon cockroaches, the theory of Ambroise Paré, that coitus with a menstruating woman would bring forth monsters, the souring of milk by the proximity of a menstruating woman, etc.

The old belief in the dangerous qualities of menstruation, together with the disagreeable nature of the process to the woman, is perhaps chiefly responsible for the euphemistic manner in which women, especially of the lower classes, are accustomed to speak of it among themselves. As Havelock Ellis points out, the very word "menses" ("monthlies") is in itself a euphemism. Schurig remarks that in both Latin and Germanic countries, the function was commonly designated by some term equivalent to "flowers," indicating, perhaps, that it is a species of blossoming, with the possibility of bearing fruit. German peasant women, for example, according to Schurig, speak of menstruation as the "Rosenkrantz" or rose wreath. The Italian women, he further remarks, give it the more high-sounding and dignified designation of "marchese magnifico," while the Germans of higher class sometimes use the expression, "I have had a letter" to denote the advent of the period.

Similar expressions, as is well known, are made use of among many women in our own country—such expressions as "coming around," "having company," and the like. It is interesting to note that such euphemisms are employed even among savage peoples. Ellis quotes Hill Font as recording the use among the Indians of such expressions as "putting on the mocassin," "putting the knees together," and "going outside," the last evidently referring to the custom of secluding the woman in a solitary hut at this period.

There is one other of these ancient superstitions which must be commented upon, and that is the association which has always been made in folk lore between woman and the serpent. Whether it was the Satanic rôle of the serpent in the episode of the Garden of Eden which was responsible for this association with the descendents of Eve it is difficult to say, though this seems a logical assumption. In Germany it was believed up to the 18th century that if one planted in the soil a hair from the head of a menstruating woman it would be converted into a snake. Among certain tribes in South Australia menstruation is thought to be due to the scratching of the vagina by a bandicoot, which thus causes the blood to flow (Ellis). In Portugal it is believed that women during menstruation are especially apt to be bitten by lizards, and they guard against the risk by wearing drawers during the period (Ploss). It has been pointed out that in various widely separated parts of the world the snake is believed to be the original cause of menstruation, although no adequate explanation is offered for this deep-rooted superstition.

From the belief that menstrual blood is very poisonous, it was, as Ploss remarks, only a short step to the supposition that it might exert a powerful influence against sickness. In an age when physical disease was commonly looked upon as the result of the activity of Evil Spirits, it is not surprising that the most trustworthy remedies for driving out these enemies of man were usually the most disgusting. Menstrual blood, according to Pliny, was recommended for the following diseases, among others: gout, goitre, hemorrhages, inflammations of the salivary glands, erysipelas, furuncles, puerperal fever, hydrophobia, epilepsy, worms, headache, etc. As a remedy, Velsh gave menstrual blood the name of "Zenith." It was prepared by extracting the dried blood from cloths by means of Rhein wine or vinegar.

The first napkin worn by a healthy virgin was put aside "for use in cases of plague, malignant carbuncles, and other diseases; it was damped with water and laid on the part; the discharge was also used as a topical application in acute gout" (Crawfurd). Avicenna recommended menstrual blood as an external application for sores of all kinds. For the cure of quartan fever Ictidas, according to Crawfurd, recommended coitus with a woman who was just beginning to menstruate. The same author states "that medicine men, when about to compound their medicines, were in the habit of making a saving clause that the remedy would be effective, provided no menstruating woman approached their chamber during the compounding process."

Not only as a medicament, but also as a charm, was menstrual blood considered potent. A garment, stained with the menstrual blood of a virgin, is considered in parts of Bavaria a certain safeguard against cuts and stabs. It will also extinguish fire, and is valuable as a love philtre (Ellis). Strack gives instances, occurring even in the Germany of to-day, of girls who administered drops of menstrual blood in coffee to their sweethearts, in order to retain their affections. It is even said (Ellis) that a sect of Valentinians attributed sacramental virtues to menstrual blood, and partook of it as the blood of Christ.

Pliny speaks of the general belief among the Greeks and Romans that a menstruating woman could quiet a tempest, and that she could therefore rescue a ship beset by storm and wave. Daniel Becker (quoted by Ploss) states that, if a cloth stained with menstrual blood be fixed on a pole in a field, the hares will congregate to this place in such numbers that they can easily be shot, and even caught in the hand. In certain countries, especially Italy, cloths stained with menstrual blood are said by Eckarth to have formerly been sold as charms against evil spirits. All these superstitions applied especially to the menstrual blood passed at the first period.

One more instance of the superstitious belief in the magical potency of menstrual blood may be cited from the prolific Pliny. He says: "If a man take a frog and transfix it with a reed entering its body at the sexual parts and coming out of the mouth, and then dip the reed in the menstrual discharge of his wife, she will be sure to conceive an aversion for all paramours."

A monthly purgation of impurities, through the medium of menstruation, was looked upon by many of the old writers as

necessary for the promotion of conception. As Freind pointed out, however, if this were true, "no woman would conceive except those who had undergone it, which is wholly repugnant to experience." Other authors (Astruc) suggest that conception is promoted by menstruation either by "forcibly exciting the woman to coition or by the fact that the menstrual discharge opens up the uterine canal, so that the spermatozoa have freer entrance into the uterus."

Mention must also be made of the theory of Galen and his followers, that "the menses are given to women that they may be evacuated for their health's sake and yield nourishment to the embryo when suppressed by conception." This is the view supported later by John Freind. Hippocrates himself believed that "if a woman with child have her menses, it is impossible that the foetus shall be well, because the growth of the foetus is abated by the menses." In the same belief Celsus stated that "if milk flow from the breasts of a woman with child, whatever she bears must be weakly."

Leaving aside these differences of opinion with regard to the *raison d'être* of menstruation and turning to the direct or efficient causes of the phenomenon, it is of interest to note that at least one of the theories prominently discussed among the medical profession, even up to the first quarter of the 19th century, was virtually of folk-lore origin. Certainly it was supported by no scientific observations. I refer to the theory that the rhythm of menstruation is under the influence of the moon.

The fact that the length of the menstrual cycle corresponds to one lunar month led many of the older writers to attribute to the moon a powerful causative influence on the process. "Luna vetus vetulas, juvenes nova luna repurgat." The absurdity of this theory, in accordance with which all women in the same locality would menstruate at the same time, does not seem to have appealed to them.

The celebrated Dr. Mead wrote a treatise on "the influence of the sun and moon on human beings," wherein, according to the prevailing notions of the time, he labored to show that both luminaries exert much action upon animals. In speaking of their influence on periodic hemorrhages, he says: "And this action of the moon pertains even to those quadrupeds that menstruate, for it has been observed that they generally have those evacuations about the new moon; in particular, mares and monkeys; and so constantly that, according to the testimony of Horus Appollo, the Egyptians painted the cynocephalus to represent the moon, upon account of a certain symptom, whereby the female of this animal has evacuations of blood from the uterus at the new and full moon; and they kept monkeys in their temples in order to point out the times of the conjunctions of the sun and moon, whereon the moon's influence is apparent in all animals, provided irregularities in their way of living do not prevent it."

Among the old authors who adhered to the theory of lunar influence on the menses were Aristotle, Van Helmont, and others. Gall, while not admitting any such influence, believed that the discharge takes place generally at about the same time in all women, and that there are certain weeks in which no women are menstruating. He divides the menstrual epochs into two groups, embracing the first eight days of the first and second fortnights, respectively, *i. e.*, the first and third weeks of the month. If women happen to menstruate during the second and fourth weeks, the occurrence is, according to Gall, accidental, for after some months they again fall under the obedience of the general law.

The other theories as to the cause of menstruation which held sway during the earlier portion of the last century—the ferment theory and the well-known plethora theory of Galen—were scarcely less far-fetched than the one just discussed, but, inasmuch as they possessed at least a pseudo-scientific basis, they can scarcely be included in a discussion of the folk-lore of menstruation. The really scientific study of menstruation dates from the work of Négrier, in 1832. The 20th century, young though it is, has yielded perhaps the most valuable contributions that have been made to our knowledge of the cause and mechanism of this, one of the least understood of the phenomena of the human body. Modern methods of scientific investigation are gradually sweeping away the cobwebs of mystery and superstition which have accumulated about the subject in its passage down the folk-paths of the centuries. On the other hand, can we reasonably doubt that our present finely spun theories of menstruation will excite among medical historians of the future the same compassion which we now bestow upon the crude beliefs of our scientific forbears?

# PROCEEDINGS OF SOCIETIES.

## THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

*MAY 1, 1916.*

1. **Treatment of Neurasthenia.** Dr. Austen Riggs, Stockbridge, Mass.

   To appear later in the Bulletin.

2. **A Demonstration of the Efficiency of Motion Pictures in Teaching Surgical Technic.** Dr. J. Bentley Squier, New York City.

## THE LAENNEC.

*MAY 5, 1916.*

1. **Contribution to the Study of Prognosis.** Dr. Herbert M. King, Loomis, N. Y.

   To appear later in the Bulletin.

2. **The Study of Immunity to Tuberculous Infection from the Cellular or Tissue Standpoint.** Dr. Allen K. Krause, Saranac Lake, N. Y.

## THE JOHNS HOPKINS HOSPITAL HISTORICAL CLUB.

*May 15, 1916.*

1. **Exhibition of Medical Portraits Presented to the Hospital.** Mr. Blanchard Randall.

I shall say only a few words, perhaps somewhat in the way of explanation. These pictures are to supplement the valuable Fisher collection which Dr. Kelly gave to the Hospital many years ago, and which we hope to continue with various supplements. The making of this collection was a great satisfaction. We picked up some of the pictures because they pleased us, sometimes because

they looked like somebody, or perhaps because our little group of friends at home thought it was interesting to have this or that picture. Gradually the number increased, until, through Dr. Welch's influence and the magic charm of his spirit, the thought came that these pictures would supplement the Fisher collection.

I cannot tell much about etching and engraving in a few words. I was always struck with the French word "*engraver*" which means to push a boat on the sand, and that describes exactly what etching and engraving means. To push half a dozen boats on the sand is what the engraver does with his tools on copper. In this little collection we started at about the year 1725, with some of the masters in art at that time, and traveled about two centuries, until we came to such a picture as that at the end of the line which is only about ten or fifteen years old.

In the year 1725 engraving was done on both wood and copper. Indeed, throughout the sixteenth century, the wood engraving was of a very high order. The Germans, more than any other nation, used wooden blocks. The history of engraving shows that the Chinese antedated the Germans in this art, but through the fifteenth and sixteenth centuries the Germans carried it to a high point of perfection. Later the English took up wood engraving, and still later the art fell into a mere trade to illustrate books, until in our own day, in America, Cole and Wolf have done, with wood blocks, work which has never been done before in the history of the art.

In the seventeenth and eighteenth centuries engraving had ceased to be a workman's trade and had become a real art. From the middle of the seventeenth century engraving in pure line in France, and what is called mezzotint in England, were the two mediums in which the art was brought forward. That was the highest point in the French art and perhaps the highest point in the English.

Finally, in the nineteenth century, the old etching processes that Rembrandt made so famous grew again in favor. Of recent years the use of etching and engraving, coupled with both stipple and mezzotint, has made very beautiful figures and scenes. The use of these methods in the same plate, which were very distinct in previous years, but which are now used together to get results quickly, has commercialized too much the modern work.

The French were very successful about the middle of the nineteenth century in colored engravings. These were really engravings on stone, or lithographs. In the eighteenth century the English were especially successful with portraiture.

Some of my happiest hours have been spent with these pictures and I shall hope to revisit some of these scenes again with Dr. Welch.

## DISCUSSION.

DR. HURD: I hope that Mr. Randall will still feel a sense of proprietorship in these pictures and consider them as simply a loan to us. On behalf of the Hospital, I wish to thank Mr. Randall for his generous gift.

Dr. Kelly looks as though he had something to say to us.

DR. KELLY: I feel ashamed to open this unpretentious package after what Mr. Randall has given. The pictures are not only portraits which doctors might like to look at, but they are also fine examples of the collector's instinct which Mr. Randall has so well developed. These pictures are only a small portion of his magnificent collection, but they are worth feasting the eyes upon, especially the example of Larrey.

The Albinus is evidently about 100 years old and made from some old wood block. Probably a copy.

Here is a portrait of John Dalton, the founder of scientific chemistry. He belongs in this group, because all we know about color blindness we owe to John Dalton. A close look at the picture will show the earliest chemical symbols, a little black and two small white spheres, intended to represent carbon dioxide. The atomic theory dates from John Dalton.

I have brought with me a few pictures to add to the collection. They have not any special artistic merit. Among others, there is Wharton, who discovered the duct which bears his name, Sömmering, the anatomist, and this portrait of Celsius, which is, I suppose, what people imagined he looked like. Here is a portrait of Philip Peu or Parva, a little known surgeon of Paris, who lived in the latter part of 1600, and who used part of his name in his motto: *Tam solers quam parva.* Mr. Randall's portrait of Alexander Monro is better than the one I have brought. You will remember that there were three Monros. The first and second were distinguished anatomists. The last one used to come before his classes and read his grandfather's lectures on anatomy, and the members of the class were much entertained when he would read, for instance, of some event that happened when he was in Leipsic sixty or eighty years before.

I also have brought over pictures of Mascagni and Lancisi and this one of Ruysch, the great anatomist, who worked over the lymphatics and made the magnificent collection that was bought by Peter the Great, who wished to take it to St. Petersburg. On the way, however, the sailors drank all the alcohol off the anatomical specimens, and Ruysch had to go to work all over again. This is not so strange as it may seem. I well remember when I was a student in Philadelphia that Leidy's collection lost its alcohol at a remarkable rate, and Leidy had to take the alcohol and put arsenic in it in the presence of our prosector.

As I said before, I am ashamed to present these pictures in view of the splendid examples before us presented by Mr. Randall.

MR. BROEDEL: I am sure that some of you know as much as, and perhaps more than, I do about what you like in pictures of great men. What we usually consider necessary for the appreciation of a portrait is that the likeness of the individual should be represented with a fair degree of accuracy. Of course, we can have no means of judging whether these pictures represent the features of these famous physicians and surgeons. The next requisite in the value of a picture is the pose—the characteristic pose which the individual assumes most of the time. That is necessary to make a good portrait. The third is the artistic treatment of the features and of the accessories, such as the hair, hands, garments, etc. That requires the artistic touch. The last requisite is technique, perfect treatment of the surfaces to represent the character of the tissues of the eyes, hair, skin, etc.

The layman's judgment of the value of a portrait, be it painted or etched, is usually affected by modern photography, and we demand in our contemporary portraits and oil paintings, and in mechanical reproductions, absolute fidelity—an absolutely faithful representation of the features—or we are not favorably impressed. These portraits cannot be judged by such standards. The connoisseur's standpoint of judging these works of art is totally different from that of the layman. It is technical and historical; he takes into consideration the difficulties the engraver had to overcome.

Of course etchings and engravings are not original productions, but are usually copies of a painting, and most of us criticize old prints because of certain shortcomings which are common to nearly all. These defects are absent in a large number of the pictures exhibited here, as this is a remarkably fine collection of old prints from the standpoint of artistic treatment and technique. Most old prints are not pleasant objects to look at for a number of reasons. We complain of a certain monotony of features; that they all look more or less alike, just as old Egyptian figures look alike; and sometimes we suspect that the artist was not very faithful in copying his man. We complain of a certain lack of expression and a fixed, lifeless appearance of the eye, and of the regions around the eye. That is a common shortcoming in most of the old prints. The conclusion we draw is that there is a certain inferiority of the artist who was commissioned to do the work. Nine-tenths of the old prints exhibited were originally painted by second-rate men, and the engravers were in the same class.

Painters like Rembrandt, Rubens, Holbein, Velasquez and Reynolds are scarce. They are usually monopolized by royalty and the princes of the church and of commerce and do not go around; so that most of the work is done by second-grade men. I have even been impressed with the fact that first-class artists did not copy the human face with a remarkable amount of accuracy. For instance, in studying the portraits that Rembrandt painted of himself, we are struck with the fact that they do not look alike, and so conclude that Rembrandt took liberties when painting portraits. A great many painters prefer a good picture to a portrait. They prefer to make harmony in tints and a perfect composition in lines rather than a faithful representation of the features of the man they are painting.

As I said before, what we admire most in modern paintings and modern engravings is this absolute fidelity to nature. We consider them superior as far as realism is concerned; and that is right. The reason for this superiority of modern work is of course the camera. Photography has given to the artist a means of judging the exactness of his work and has had a beneficial effect upon the accuracy of his work. I do not mean to argue that photography is by any means equal to painting, but there is no question but that accuracy in regard to form is provided by the work of the camera. An artist would be ashamed to let a picture go out that does not look like the subject, when the photograph shows him what it should be.

All the pictures shown here, with the exception of one or two, are done without photographic aid. All true art must be done without photographic aid. To see nature through the artist's eye is a joy to man. There is no question but that a May morning described by a poet is a very different thing from a May morning seen by a farmhand; and an intellectual face represented by a Sargent or a Joshua Reynolds is a more pleasing object to look at than a face as seen by a floorwalker, let us say. The highest type of portraiture, therefore, is a perfect balance between the subjective view of nature, which is the artist's view of it, where you have evidence of the artistic feeling in every square inch of the canvas, and at the same time absolute fidelity to nature, so that the impression will be satisfactory.

These etchings, engravings, mezzotints and lithographs were done, as I have said, without the aid of the camera. All of these were first painted, drawn or sketched, and in the reproduction each must have suffered a little in veracity, as each worker takes a little liberty, although perhaps unconsciously. Each painter has undoubtedly taken liberties with the form, for each painter likes certain features. If one painter is struck by an extraordinarily pleasing eye, he dwells on that and paints the feature as he sees it. This experience is found in every work of art. The artist puts his soul into the painting and shows the object as he thinks it ought to look. This toying with the truth does not affect the same features in every case. The engraver may be struck with the charm of the contour of the nose, so he takes liberties with the nose, and gets a gradual departure from the truth, with the result that the final engraving may not in the least resemble the person it was intended to represent.

These are the difficulties of the first class, but there are also other difficulties. For instance, almost all of the originals were life size, and the engraver had to reduce that life size portrait to perhaps one-half, one-third, one-quarter or even one-fifth the measurements of the human face. That is a very difficult process, as very slight deviations in the proportions of the human face absolutely ruin the likeness of the face. The engravers have to work without the aid of the camera, and not only that, the entire process is reversed. What is right in the portrait is left in the plate, and the engraver must work in a mirror, reversing every line. That is not a method which makes for accuracy. The most important parts of the portrait are the nose, eyes and mouth, and it is interesting that it is not so much the individual feature—that is, the eye itself or the nose—as the juxtaposition of the two which makes for likeness. The least difficult thing is technique. As I said, the engraver never knows exactly what he is doing, because he does not see the picture while he is engraving as it is to appear in the print. It is reversed, and he has a black ground on which the drawing appears as bright, coppery-red lines. This is often a disturbing factor. He is compelled to take frequent impressions to see what the final results will be. This difficulty is not shared by the lithographer, who works on a stone of a greyish color on which he draws with a black, oily crayon or oily ink. Some of the portraits here are lithographs and are remarkably well done. Lithography is of course a more recent method, whereas engraving on copper is centuries old. The mezzotint portrait before us shows evidence of photographic aid. By the expression of the face, it can be seen that the engraver controlled his work with the aid of the camera.

Dr. William H. Welch: We are all deeply indebted to Mr. Randall for this delightful gift to supplement the Fisher collection, which we owe to the generosity of Dr. Kelly. It is good to be surrounded by portraits of medical men and to cultivate an interest in the iconography of medicine. We have endeavored here to create that sort of an atmosphere. It is not always perhaps best secured by efforts which seem to be most direct for the purpose, but sometimes by indirect methods of attack you may inspire in the student an interest which adds much to the life and enjoyment of the physician in his profession, and which makes all the difference between the practice of medicine as a profession and as a money making trade.

Medical portraiture is a specialized subject and I cannot claim any expert knowledge of it. One of the most famous medical paintings in the world is Rembrandt's "School of Anatomy." Dr. Garrison has selected another "School of Anatomy" to illustrate his excellent book on the history of medicine, and there are several others. The Guild pictures of the seventeenth century are also extremely interesting. The greatest of those are the Franz Hals pictures in Holland. I recall visiting a hospital in Delft where there was a magnificent Guild picture of medical men.

Mr. Broedel has presented very delightfully the artistic side of portraiture. Those interested in history and biography find an interest in portraits in general quite apart from the artistic merits of the picture. I know of no one who has expressed that quite so well as Carlyle in one of his letters written in 1854. I do not know that I have ever seen a better expression of the kind of interest attached to a portrait.

I am somewhat at a loss as to what to say on this occasion. A number of thoughts have occurred to me, and one is: Whose likeness is apt to be perpetuated by a painter and especially by one of the great masters of painting? What doctors are likely to be painted by Holbein, or Van Dyke, or Sir Peter Lely, Sir Joshua Reynolds or Gainsborough? What sort of a record would we find if the names were selected on the basis of the preservation of the likeness of such great physicians? One can determine that by looking over the names of the great surgeons and physicians to see if they were ever painted and, if painted, whether by first class or cheaper artists. Certain ideas occur to one. Many probably took no interest in being painted. Others may have been connected with a hospital or an institution, or perhaps made some benefaction, and may have been painted at the solicitation of the authorities of that institution. We find here, for instance, a wonderful portrait of John Ash painted by Sir Joshua Reynolds. John Ash was very active in founding a hospital, which is seen in the background of the picture. He afterwards went to London to live, and the trustees of the hospital thought it would be wise to perpetuate the portrait of John Ash, who was not a figure of any importance in the history of medicine, but who founded a hospital and so got his portrait painted. There is another excellent portrait here of

a man I never heard of before—Remmett, a Plymouth physician. He was very active in founding a medical society in Plymouth, and so he lives for all time in this fine picture. Then again, a man may have done some great service, like Woodville who went to France with the first vaccination treatment. The people in France subscribed for this interesting portrait of Woodville, and he deserved it.

Again, I think you will suspect that the great, wealthy and fashionable practitioners are pretty sure to have been painted, and that indeed is the case. There is no portrait of William Heberden that compares with the portrait of Richard Warren his contemporary, who was a fashionable physician in London, but who contributed nothing to medicine; whereas Heberden's is one of the great names in medicine. Warren had a large practice and was a good doctor in that day. He made more money than anyone else prior to his time, and he was painted by Gainsborough and also by others.

The great surgeons of the early part of the nineteenth century were deserving of being perpetuated. Sir Astley Cooper and Abernethy were sure to have been painted by the leading men of their time.

From that point of view, it is somewhat interesting just to run over the list. I have made a memorandum, not very accurate, of English physicians, beginning with the early part of the sixteenth century, Linacre, Kaye, or Caius, and Sir Theodore Mayerne. Then in the early part of the seventeenth century there were Harvey, Burton, Glisson and Mayo, who typified the spirit of their day. In the eighteenth century, the days of Steele, Addison, Pope, Pryor and Gay, the doctors who belonged to the same circle, and who held their own there, were Garth, Arbuthnot, Meade and of course John Radcliffe. This takes us up to the days of Matthew Baillie and Sir Henry Halford. Matthew Baillie was painted beautifully, but Halford was the figure of the day in medicine.

It is interesting to think of who were the great painters at the same periods. What a glory to have been painted by Holbein, or later by Van Dyke, or Sir Peter Lely or Sir Godfrey Kneller. Then comes the English school of the eighteenth century with such great names as Sir Joshua Reynolds, Gainsborough and Romney, with Raeburn in Scotland. Remembering these names, it is worth considering how the great doctors fared. Who was painted by Holbein? Sir William Butts! It is a wonderful picture, indeed, one of the greatest in the world. He was painted twice by Holbein, and his wife was also painted. Butts was the Court physician to Henry VIII and had great influence with him, but he contributed nothing to the advancement of medicine. However, he is in one of the most famous pictures in the world, that of Henry VIII giving the charter and seal to the Barber-Surgeons' Corporation. This was founded in 1540 and the picture represents John Chambre, with Butts on his right hand. The King is handing the charter to Thomas Vicary. Dr. John Chambre is perhaps the only one you have heard a little about. Butts was not the founder of the corporation, but Chambre was, and Linacre was one of its great names. There is a separate picture of Chambre by Holbein, which hangs in the galleries in Vienna. Linacre was also painted and the portrait is attributed to Quentin Matsys, but this is not probable. There are several portraits of Caius, or Kaye, but none by artists who were very well known.

Sir Theodore Mayerne was undoubtedly the leading practitioner of his day and a most interesting man. He comes off pretty well. There is a beautiful drawing in color of him by Rubens in the British Museum. Harvey was painted by Cornelius Johanssen, and there is an oil painting of Harvey, which is probably contemporary, in the Hunterian Museum in Glasgow.

There is a very interesting painting of Sir Charles Scarborough, the physician of Charles II, painted for the Barber-Surgeons' Company, by Robert Greene. Then comes Sir Francis Prujean, who lived in the middle of that century, who was president of the Royal College of Physicians, and who was painted by a quite insignificant painter named Robert Streeter. Pepys says of Streeter: "A very civil little man and lame, but he lives very handsomely." Streeter was eulogized in a poem, from which I have taken two lines:

"That future ages must confess they owe
To Streeter more than Michael Angelo."

There is a portrait of Glisson, but the painter is not known. Boyle was a very busy man, who did not care very much about being painted, although there is a portrait of him by Frederick Kerseboom.

Who was painted by Van Dyke? Sir Kenelm Digby, who figures in the practice of medicine by his quackery. Valentine Greatrakes was another great quack of that period. There is a very interesting portrait of him by William Faithorne. The seventeenth century was, if anything, characterized by more quackery than the period in which we live. I think you can establish the thesis that charlatanry flourishes rather in ratio to the development of science. All periods of great scientific enlightenment are always characterized by great charlatanry and quackery. This was true of the eighteenth century and it is true to-day. Greatrakes was a wonderful quack.

The best of the Scottish group were of course painted by Raeburn. Sir Hans Sloane was repeatedly painted by Kneller. Radcliffe was also painted by Kneller, as was also Sir Samuel Garth, a member of the Kit-Kat Club, whom you will remember from the interesting paper presented here by Dr. Harvey Cushing some years ago. There is also a drawing of Garth by Hogarth, which is of course very interesting.

Richard Wiseman was the first really great English surgeon. He was very much admired by Dr. Johnson. There is a very fine miniature of him by Samuel Cooper. Cheselden was painted by Richardson. William Hunter was admirably painted by Sir Joshua. Percival Pott was also painted by Reynolds, and there is an excellent portrait of him by Romney. Sir Cæsar Hawkins, who was not a great man, was painted by William Hogarth.

The man who took the place of Kneller during the same period in Scotland was Medina, a Spaniard, who painted Archibald Pitcairn. Alexander Monro *Secundus* was painted by Raeburn, who is sometimes called the Scottish Reynolds. He was a most interesting painter and a man whose fame has steadily increased.

Among the portraits exhibited to-night, one of the earliest is that of de La Mettrie, a physician celebrated in the history of philosophy. He advanced the most extreme mechanistic view of man that I suppose has ever been taken. His great work is called *La bonne machine*, and he looked upon man as being nothing more than a piece of machinery. He could not live comfortably in France, so he went to Holland, which was quite a refuge at that time; but he did not remain there very long and traveled still farther to find a congenial resting place.

Claude Perrault is a very interesting figure in the seventeenth century. He was a physician who practised and wrote, and he was also a great architect. It is very interesting to collect the performances of physicians outside of their profession. In that respect we can almost claim Sir Christopher Wren, who belonged to the group of doctors at Oxford in 1650, the group which led to the formation of the Royal Society. It was a most fascinating period, and Sir Christopher Wren, whose name simply occurs to me, was one of the greatest of architects. So also with Claude Perrault. He was a brother of that Charles Perrault, whose fairy stories are models of their kind.

Here is a portrait of Huyghens, who was a great mathematician, anatomist and physicist. He made wonderful studies in physical optics and prepared the way for Newton's corpuscular theory and for Sir Thomas Young, the great physician who brought forward the wave theory of light.

Philippe Colot was one of the great lithotomists of that period. Those were the days when cutting for stone was a separate specialty. There were many traveling quacks, and some very interesting characters among them.

Albinus was one of the greatest anatomists, teachers and illustrators who ever lived. He was a professor in Leyden, a younger contemporary of Boerhaave. It was to Leyden in this period that the Scotch and English students went.

Sir Thomas Millington was a professor at Oxford and president of the Royal College of Physicians. He belonged to that group I have spoken of, "the invisible college," and was one of its most distinguished members. Indeed, I think anyone Sydenham thought was a good doctor must have been, as he did not care much for most of his colleagues.

Here we see Thomas Pellett, a physician in the first half of the eighteenth century. He was the friend of Radcliffe, Arbuthnot, Freind and Sir Hans Sloane. Arbuthnot is perhaps the best known of the group on account of his intimacy with Pope.

Alexander Monro the Second was the great Monro. From 1725 until we approach 1840, the three Monros were professors of anatomy at the University of Edinburgh. The first one was a very eccentric man. The second was very distinguished; he was trained in Germany and was a most admirable character. The third was not to be classed with either of them. They resisted efforts at reform in medical education in Scotland, and especially resisted the establishment of a chair of surgery, which did not exist until well on in the nineteenth century.

Here, by Sir William Beachy, a contemporary of Sir Thomas Lawrence, is a portrait of Sir Everard Home. The indelible stain rests upon his name of having destroyed the valuable manuscripts of John Hunter.

And here is a most interesting portrait of William Woodville, of whom I have already spoken. He plays a great part in the introduction of vaccination. Indeed, the anti-vaccinationists contend that, if it had not been for Woodville, vaccination would never have succeeded. He was also an eminent medical botanist and wrote a botany in four volumes. He was physician in the inoculation hospital in London. At first he was opposed to Jenner, but afterwards became one of the best workers. He obtained cow-pox lymph and at this hospital practised vaccination.

Henry Harrington's portrait is very interesting. It was painted by Thomas Beach, who was a very actively employed painter of his day. Harrington was a physician in Bath and is best known for his history of music. He comes straight down from Sir John Harrington, of whom I am sure some of you know.

Joseph Black's is perhaps the greatest name on the list. He was both a chemist and a physicist. Never did a medical student publish a graduating thesis comparable to his. He was a medical man and a pupil of Cullen. He was a professor of chemistry first in Glasgow and later succeeded Cullen in Edinborough. He was the discoverer of what was, perhaps unfortunately, called latent heat. He was an excellent teacher and an active man in the wonderful circle in Edinburgh.

I shall pass over Vogel, who was a professor of anatomy and medicine, and John Heaviside, who was surgeon extraordinary to the King and who collected a museum. This was in the period after John and William Hunter, when all were collecting anatomical specimens.

Here is a lovely picture of Matthew Baillie, the nephew of John and William Hunter and the brother of Joanna Baillie. He was taught by William Hunter and succeeded him in the Great Windmill Street School. From teaching and investigating work, he became the leading physician of London. His *Morbid Anatomy* published in 1795, while it has not the significance of Morgagni's, is the first work devoted exclusively to that subject and presented it just as we do to-day.

We next come to Lucas, who gets several pages in the Dictionary of National Biography. He was a painter as well as a doctor.

Berthollet was a great chemist, indeed he was one of the founders of physiological chemistry. He was painted by Rembrandt Peale, a son of Charles Wilson Peale. There were about eight of the Peales who were painters. Charles Wilson called his sons by such names as Rembrandt, Raphael and Titian, and they all painted. Rembrandt studied with Benjamin West and afterwards worked in Paris. He was an extraordinarily versatile man.

A most fascinating doctor was John Mudge. He was a Plymouth man and one of the famous village physicians of England. Mudge well deserves to be perpetuated. He was quite interesting, as was his father before him, Zacharias Mudge, the subject of that wonderful Johnsonian epitaph. The son was the friend of Joshua Reynolds and Samuel Johnson, who visited Plymouth and were entertained by Mudge. Johnson used to consult Mudge about his ailments. At one time an operation was proposed and he wrote to Mudge something in this line: "It probably is painful, but is it dangerous? I hope to bear the pain with decency, but I am loath to subject myself to much danger." Mudge was a charming man, and the London physicians used to send their patients down to him on account of the life-giving qualities of his talk and personality. He was painted by Sir Joshua Reynolds.

Joshua Brooks was head of one of the private schools. This movement began in the eighteenth century and led to the Great Windmill Street school. There were many other schools and one of the most celebrated was Joshua Brooks'. Most of the Americans studied in these schools, and when the time came to do away with them and have hospital schools, there were all sorts of complications.

Larrey is celebrated as an oculist. Jenner, Dalton, Remmett, Cuvier and Cooper are also interesting. Cooper was a professor of surgery at the University College and wrote a surgical dictionary. Owen was a prosector for Abernethy.

Here is a beautiful portrait of Abernethy, who was one of the greatest teachers who ever lived. It is interesting to contrast Abernethy with his contemporary Sir Astley Cooper. They were very different men. Abernethy is to be regarded as the custodian of John Hunter's ideas and thoughts. He expounded Hunter's doctrines and especially that doctrine of the constitutional origin of local diseases, the treatment for which was characteristic of English medicine for a long time—dieting the patients and giving mercury, calomel and purges. All that comes from Abernethy, who was one of the great characters of medicine and who made a tremendous impression on his pupils.

Sir George Johnson's is another example of a painting having been done at the instance of a hospital and the pupils. His beautiful picture was painted for King's Hospital, which he served for many years. Johnson's name is identified with Bright's disease which he studied for a long time.

I have not begun to express really the interest there is in tracing the history of medicine as one can from these portraits here. I hope I have indicated to you how fascinating it is to take any one of these men and fit him into his environment, and how much it adds to that kind of study to have these charming portraits with us.

Dr. Arnold C. Klebs: "Art is long, but time is short," to paraphrase Hippocrates, and so I shall not occupy more of your time than to express my warm appreciation for having been allowed to be present on this unique occasion. Mr. Randall's words of presentation seemed to carry a message of particular significance. In these strenuous times a collector so rarely seems to have time to love his collection. And somehow, as he reviewed one after the other these beautiful prints, I could picture him sitting over them day and night, viewing with the eye of the *connoisseur* these delightful products of the artist's point and

burnisher, and treasuring their possession. May they find this same affectionate interest and care in your keeping!

Inspiring also were the words of Mr. Broedel, artist himself and master in the technique of medical illustration. Your interesting "Institute of Art in Medicine," which he heads, daily draws together artist and physician in useful cooperation. And those of Dr. Welch, whose admirable talk has animated these gentlemen on the wall, so that they have come down among us from their frames, closer to our scrutiny and simple human understanding.

It all brings to one's consciousness the very close relationship that really exists in the aims of artist and physician. We should not fail to remember it. Our common aim, primarily, is toward Truth and its expression. For what end? For our own satisfaction, for our sustenance, and to bring artistic joy or health, in our case, into the lives of others. In the last analysis it leads to same results, except that the artist has what we lack too much—the inspiration of beauty. In the Middle Ages, in Florence and other cities, one of the major guilds united both physicians and painters. At first they also were drug sellers and color grinders. Then in that general aim to make medicine an exact science, the physician has more and more drawn away from the artist. When Dr. Streeter, not long ago, told us here of the close cooperation of Florentine artists and physicians, it occurred to me how much true art often loses by a one-sided concentration on technique, we physicians on instrumental precision, the artist on new pigments, binders, etc. It seemed to me time for a new guild of physicians and artists. Something must bring back into our busy lives the inspiration of beauty, bring us to the warm delight in line, form and color, make us dissatisfied with that "beauty" which Sunday newspapers and artistic posters inflict upon us daily.

To illustrate the rôle of artists in the divulgation of medical thought and the various means employed in historical sequence, I have arranged at the Surgeon-General's Library a little exhibition, selecting from that fine collection the most characteristic specimens in black and white, as well as in colors. It may perhaps interest some of you to examine these examples, some of which are exceedingly rare.

### Medical Portraits in Etching, Engraving and Mezzotint Given to The Johns Hopkins Hospital by Mr. Blanchard Randall.

Abernethy, John, 1764-1831. (Aberncathy on portrait.) After Lawrence, by Bromley.

Albinus, Bernardus Siegfried, 1696-1770. Car. de Moor pinx. I. Iac. Haid sc. et excud. (or J. J. Haid.)

Ash, Joannes, 1723-1798. Painted by *Sir* Joshua Reynolds. Engraved by Bartolozzi.

Baillie, Matthew, 1760-1823. Painted by J. Jappner. Engraved by Charles Turner.

Béclard, Pierre Augustin, 1785-1825. Lith. de Delpech à Paris. Z. Belliard.

Berthollet, Claude Louis, 1748-1822. Rembrandt Peale pinx. Allais Scot.

Black, Joseph, 1728-1799. Engraved by Jas. Heath from a picture by Raeburn.

Bourgeois, Louise, *dite* Boursier, 1563-1636. Engraving.

Brookes, Joshua, 1761-1833. Painted by T. Phillips. Engraved and published by James Fittler.

Burnie, Alexander, about 1825.

Collot, Philippes (*see* Colot, Philippes). Edelinck, sc.

Cooper, Samuel, 1780-1848. Painted by Andrew Morton. Engraved by Henry Cousins.

Corvisart, Jean Nicholas, 1755-1821. Gr. Lith. de Delpech. Bazenjne.

Cuvier, Georges Léopold Chrétien Frédéric Dagobert, le baron, 1769-1832. Painted by W. H. Pickersgill in 1831. Engraved by Geo. Doo, 1840.

Dalton, John, 1766-1844. Allen pinx. Worthington sc.

Des Genettes, Rénatus Nicolaus Dufriche, 1762-1837. Lith. Maurir. S. Lith. de Delpech.

Dubois, Antoine, baron, 1756-1837. Boilly pinx. Gautier sc.

Faraday, Michael, 1791-1867. Painted by H. W. Pickersgill. Engraved by S. Cousin.

Forlenze, J. M. A. Vallin, pinx. Gautier, sc.

von Graefe, Friederich Wilhelm Ernst Albrecht, 1828-1870. Lith. von C. Wildt.

Guersant, Médicin. Lith. de Ch. Motte.

Harrington, Henry, 1729-1816. Painted by Thomas Beach, 1799. Engraved by Charles Turner.

Heaviside, John. J. Zoffany pinx. Rich. Earlom sc.

Home, *Sir* Everard, *Bart.*, 1763-1832. Painted by *Sir* W. Beechey.

Howard, John, 1726-1790. Engraved by Edmund Scott from an original picture by Mather Brown.

Hughens. Drevet excud. Edelinck eques sc.

Huxley, Thomas Henry, 1825-1895. Painted by John Collier, 1883. Engraved by Eliot Famony (?).

Jay, Antoine, 1770-1854 (?). (A. Jay on portrait.) Gosse pinx. Z. Belliard.

Jenner, Edward, 1749-1832. Wm. Hobday pinx. Wm. Skelton, sc.

Johnson, *Sir* George, 1818-1896. Painted by Frank Holl. Engraved by Frank Short.

Larrey, Dominique Jean, le baron, 1766-1842. Lith. de Delpech.

Lucas, Charles, 1713-1771. L. Reynolds pinx. I. McArdell fecit.

de La Mettrie, Julien Offray, 1709-1751. G. F. Schmidt ad vivum pingebat et sculpebat.

Millington, *Sir* Thomas, 1628-1704. London, pub. by Dr. Thornton, 1807.

Monro, Alexander, 1733-1817. Engraved by Jas. Heath from a picture by Raeburn.

Mott, Valentine, 1785-1865. Lith. by F. D'Avignon, 1856.

Mudge, John, 1720-1793. Painted by *Sir* Joshua Reynolds. Engraved by W. Dickinson.

Owen, Richard, 1804-1892. Painted by H. W. Pickersgill. Engraved by Wm. Walker.

Pellett, Thomas, 1671-1744. N. Dath pinx. I. Faber fecit.

Perrault, Claude, 1613-1688. Vercelin pinx. G. Edelinck, sc.

Physick, Philip Syng, 1768-1837. Engraved by J. B. Longacre from a sketch by Mr. T. Sully.

Remmett, Robertus Butler. From an original portrait by John Ball. Engraved by S. W. Reynolds, 1823.

à Roy, Cornelius Henricus, 1750-1833. G. Ritter, del. L. Portman sc. J. Allart excud.

Vogel, Benedict Christian, 1745-1825. Hessel del. F. Elias Haid fecit.

Woodville, William, 1752-1805. (W. Woodwille on portrait.) Ansiau del. Perrot sc.

Wharton, Thomas, 1610-1673. From a rare print.

### Medical Portraits Given to The Johns Hopkins Hospital by Dr. Howard Atwood Kelly.

Brunyer, D. Abel, 1573-1665. Petrus Landry, sculp., 1661.

Butler, William, 1535-1617. Harding, del. Clamp sc. Publ. Oct., 1796, by E. & S. Harding, Pall Mall.

Celsus, Aurelius Cornelius. (Celsius, A., on portrait.) Jefto von Böttger aus Dresd.

Garth, Sir Samuel, 1661-1719.

Haller, D. Albertus, 1708-1777. (von Haller, Albrecht.) (P. G. Werlhof.)

Lancisi, Joannes Marias, 1652-1720. (Lancisi, Giovanni Maria, 1655-1720, Garrison.) Sebastian Conca, pinx. Iac. Frey sc., Romae, 1718.

Mascagni, Paolo, 1752-1815. Stefano Ricci, scolpi. Roberto Focosi disegno. Guiseppe Buccinello incise.

Monro, Alexander, 1732-1817 (Monro, Alexander Jun., secundus, 1733-1817). Engraved by Jas. Heath from a picture by Raeburn.

Peu, Philippe, -1707. (On picture, Peu, Philip.) S. Thomassin ad vivum delineabat & sculpebat, 1693.

Ruysch, Fredericus, 1638-1731. I. Wandelaar ad vivum delin.

Sömmerring, Samuel Thomas, 1755-1830.

# BOOKS RECEIVED.

*The Jews in the Eastern War Zone.* 1916. 12°. 120 pages. The American Jewish Committee, New York.

*Autoplastic Bone Surgery.* By Charles Davison, M. D., and Franklin D. Smith, M. D. With 174 illustrations. 1916. 8°. 369 pages. Lea & Febiger, Philadelphia and New York.

*Handbook of Massage for Beginners.* By L. L. Despard. Oxford Medical Publications. 1915. 12°. 247 pages. Henry Frowde, London; Hodder & Stoughton, London.

*The Pathology and Treatment of the So-Called Nervous Asthma.* By J. B. Berkart, M. D. 1916. 8°. 54 pages. Humphrey Milford, Oxford University Press, London, Edinburgh, Glasgow, New York, Toronto, Melbourne, Bombay.

*Treatise on Fractures.* By John B. Roberts, A. M., M. D., F. A. C. S. and James A. Kelly, A. M., M. D. With 909 illustrations: radiograms, drawings and photographs. 1916. 8°. 677 pages. J. B. Lippincott Company, Philadelphia & London.

*Nerves.* By David Fraser Harris, M. D., C. M., B. Sc. (Lond.), D. Sc. (Birm.), F. R. S. E. Home University Library of Modern Knowledge. 1913. 16°. 256 pages. Williams and Norgate, London.

*Transactions of the American Surgical Association.* Volume the thirty-third. Edited by John F. Binnie, M. D., Recorder of the Association. 1915. 8°. 825 pages. Printed for the Association, Philadelphia.

*The Principles and Practice of Perimetry.* By Luther C. Peter, A. M., M. D., F. A. C. S. Illustrated with 119 engravings. 1916. 8°. 232 pages. Lea & Febiger, Philadelphia and New York.

*Diagnostic Methods Chemical, Bacteriological and Microscopical.* By Ralph W. Webster, M. D., Ph. D. Fifth edition, revised and enlarged with 37 colored plates and 171 other illustrations. [1916.] 8°. 758 pages. P. Blakiston's Son & Co., Philadelphia.

*International Clinics.* A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. Edited by H. R. M. Landis, M. D. Twenty-sixth series. Volume I, 1916. 8°. 326 pages. J. B. Lippincott Company, Philadelphia and London.

*Manual of Vital Function Testing Methods and Their Interpretation.* By Wilfred M. Barton, M. D. 1916. 12°. 255 pages. Richard G. Badger, Boston: The Copp Clark Co., Limited, Toronto.

*Nervous Children, Prevention and Management.* By Beverley R. Tucker, M. D. 1916. 12°. 147 pages. Richard G. Badger, Boston: The Copp Clark Co., Limited, Toronto.

*Michigan State Board of Health.* Forty-second Annual Report of the Secretary of the State Board of Health of the State of Michigan for the fiscal year ending June 30, 1914. 1915. 8°. 159 pages. Lansing, Michigan.

*A Laboratory Course in Serum Study; Bacteriology 208.* Being a Series of Experiments and Diagnostic Tests in Immunology Carried out in an Optional Course Given to Medical and Graduate Students in the Department of Bacteriology, College of Physicians and Surgeons, Columbia University, New York, by the Writers. Hans Zinsser, M. D., J. G. Hopkins, M. D., Reuben Ottenberg, M. D. 1916. 8°. 184 pages. Macmillan Company, New York.

*The Basis of Symptoms. The Principles of Clinical Pathology.* By Rudolph Krehl. Authorized translation from the seventh German edition by Arthur Frederic Beifeld, Ph. B., M. D. With an introduction by A. W. Hewlett, M. D. Third American edition. 1916. 8°. 517 pages. J. B. Lippincott Company, Philadelphia and London.

*The Institutional Care of the Insane in the United States and Canada.* By Henry M. Hurd, William F. Drewry, Richard Dewey, Charles W. Pilgrim, G. Alder Blumer, and T. J. W. Burgess. Edited by Henry M. Hurd, M. D., LL. D. Volume I. Illustrated. 1916. 8°. 497 pages. Johns Hopkins Press, Baltimore, Md.

*Pulmonary Tuberculosis.* By Maurice Fishberg, M. D. Illustrated with 91 engravings and 18 plates. 1916. 8°. 639 pages. Lea & Febiger, Philadelphia and New York.

*Clinical Laboratory Technic for Nurses.* By Anna L. Gibson, R. N. 1916. 12°. 194 pages. Whitcomb & Barrows, Boston.

*Man—An Adaptive Mechanism.* By George W. Crile, F. A. C. S. Edited by Annette Austin, A. B. 1916. 8°. 387 pages. The Macmillan Company, New York.

*New York University Laboratory of Surgical Research.* Studies in Surgical Physiology from the Laboratory of Surgical Research. Volume I, 1915. 8°.

*A Report on Researches on Sprue in Ceylon 1912-1914.* By P. H. Bahr, M. A., M. D., D. T. M. and H. (Cantab.), M. R. C. P. (Lond.), M. R. C. S. 1915. 4°. 155 pages. University Press, Cambridge; G. P. Putnam's Sons, New York City.

*The Johns Hopkins Hospital Reports.* Volume XVII, 1916. 4°. 584 pages. Johns Hopkins Press, Baltimore.

*Bernhardi and Creation; a New Theory of Evolution.* By Sir James Crichton-Browne, M. D., D. Sc., LL. D., F. R. S. 1916. 12°. 72 pages. James Maclehouse and Sons, Glasgow.

*The Practitioner's Medical Dictionary.* Containing all the Words and Phrases Generally Used in Medicine and the Allied Sciences, with Their Proper Pronunciation, Derivation, and Definition. By George M. Gould, A. M., M. D. Third edition revised and enlarged by R. J. E. Scott, M. A., B. C. L., M. D. Based on recent medical literature with many tables. 1916. 8°. 962 pages. P. Blakiston's Son & Co., Philadelphia.

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